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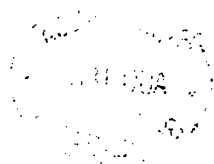
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45.\*







THE SCIENCE AND ART  
OF  
ARITHMETIC;

For the Use of Schools.

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PART I. INTEGRAL

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BY

A. SONNENSCHN

AND

H. A. NESBITT, M.A., UNIV. COLL., LONDON.

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ANSWERS TO THE EXERCISES  
*IN THE SECOND EDITION*

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1875.

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# ANSWERS.

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 (11) £558. 4s. 9½d. (12) £8888. 0s. 11½d. (13) £8127. 1s. (14) £9210. 3s. 7d.  
 (15) £100000. (16) £43393. 14s. 2½d. (17) £82432. 13s. 1½d. (18) £20427.  
 19s. 7d. (19) £145238. 11s. 8½d. (20) £4730430. 11s. 11½d.

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 (7) 1769557. (8) 358182. (9) 2995985. (10) 3142854. (11) 20287920.  
 (12) 71928512. (13) 8888888889. (14) 17105706. (15) 48743161. (16) 55638920.  
 (17) 641111192. (18) 110389. (19) 7654321. (20) 44504218.

## IV.

- (1) 340 marbles. (2) 237 pupils. (3) 929 chapters; 1189 chapters. (4) 2265 years.  
 (5) £80. 18s. 2d. (6) £485. 19s. 10d. (7) £21716. (8) 12 animals;  
 £78. 12s. 9d. (9) 220 lambs, 149 oxen, 581 sheep, 123 cows, 66 horses, 68 pigs,  
 27 calves; 1234 animals in all.

## V.

- (1) £39093. 7s. 6½d. (2) £29151. 9s. 1½d. (3) 772725143. (4) 370749464.

## VI.

- (1) £242. 2s. 1d. (2) £123. 14s. 7d. (3) £33314. 5s. 6d. (4) £7782. 6s. 8d.  
 (5) £3272. 18s. 8d. (6) £6923. 18s. 9½d. (7) £7490. 16s. 11d. (8) £55568.  
 16s. 11½d. (9) £708. 9s. 1½d. (10) £81335. 14s. 8½d. (11) £263201. 7s. 2½d.



- (12) £48166. 16s. 10d. (13) £61820. 17s. 8½d. (14) £22768. 10s. 9½d.  
 (15) £63. 13s. 3¼d. (16) £194. 19s. 0¾d. (17) ¼d. (18) £45983. 12s. 5d.  
 (19) £132. 1s. 1¾d. (20) £7203. 2s. 9¼d.

## VII.

- (1) 611514. (2) 411116. (3) 311779. (4) 167288. (5) 284859. (6) 40883.  
 (7) 3289763. (8) 2690903. (9) 1. (10) 291710. (11) 428571. (12) 277594.  
 (13) 98766. (14) 405677. (15) 183462. (16) 131335. (17) 187379. (18) 492477.  
 (19) 4716931. (20) 88989.

## VIII.

- (1) 124974; £7914. 2s. 5¾d. (2) 601954; £33227. 8s. 3¼d. (3) £21. 6s. 2¾d;  
 4609. (4) £26497. 10s. 9d.; 37682. (5) £7305. 14s. 10¾d.; 100192. (6) 28°.  
 (7) £13497. 1s. 6½d. loss. (8) 35 girls. (9) 16 years; 26 years; 26 years.  
 (10) 5 a.m.; 11 p.m.; 8 p.m.; 11 a.m.

## IX.

- (1) 7 persons. (2) 12 shares. (3) 8 times. (4) 8 heaps and 52 marbles over.  
 (5) 7 days. (6) 9 strips and 7 yards over.

## X.

- (1) a. 58; 69; 147; 294; 1090; 1804; 1519; 1100; 909; 1869.  
 b. VI; IV; XI; XXIX; CXLIV; DCLXVI; MCCII; MCXLIV; MCCXCIX;  
 MCCXXXIV. (2) a. One thousand and eight; thirteen thousand and fifteen;  
 seven millions, 12 thousand and nine; four millions, two hundred and twenty-six  
 thousand, eight hundred and forty-three; sixty millions, six hundred and six  
 thousand and sixty; nine hundred and eighty-seven millions, six hundred and  
 fifty-four thousand, three hundred and twenty-one; forty-two thousand, one hun-  
 dred and five; twenty-four thousand, one hundred and fifty; one hundred and  
 sixteen thousand and one; one hundred and ten thousand and sixty-one.  
 b. 5040; 12012; 1212; 13212; 13014015; 58000000; 20365019; 50050;  
 500050; 1001010. (3) Three million, fifty-two thousand, six hundred and four  
 UNITS; or three hundred and five thousand, two hundred and sixty TENS and 4  
 units over, wanting six units to make three hundred and five thousand, two  
 hundred and sixty-one TENS; or thirty thousand, five hundred and twenty-six  
 HUNDREDS and four units over, wanting ninety-six units to make thirty thousand,  
 five hundred and twenty-seven HUNDREDS; or three thousand and fifty-two THOU-  
 SANDS and six hundred and four units over, wanting three hundred and ninety-six  
 units to make three thousand and fifty-three THOUSANDS; or three hundred and five  
 TEN-THOUSANDS (myriads) and two thousand, six hundred and four units over,  
 wanting seven thousand, three hundred and ninety-six units to make three hun-  
 dred and six TEN-THOUSANDS; or thirty HUNDRED-THOUSANDS (lacs) and fifty-  
 two thousand, six hundred and four units over, wanting forty-seven thousand,  
 three hundred and ninety-six units to make thirty-one HUNDRED-THOUSANDS; or  
 three MILLIONS and fifty-two thousand, six hundred and four units over, wanting  
 nine hundred and forty-seven thousand, three hundred and ninety-six units to  
 make four MILLIONS. (4) A.D. 849. (5) A.D. 1087. (6) 36 miles. (7) 370

miles. (8) A.D. 1805. (9) 2016. (10) 1998. (11) Monday, £456. 18s. 9d.; Tuesday, £1019. 16s. 8d.; Wednesday, £563. 2s. 6d.; Thursday, £0; Friday, £145. 17s. 6d.; Saturday, £680. 10s. 3d. (12) £145. 16s. 10d. (13) £1. 13s. 4d. (14) 6 weeks and 2s. 6d. over; £2. 7s. 1d. (15) 12 months and five days over. (16) 32811 soldiers. (17) August 1. (18) Half-past eleven. (19) Twenty minutes past twelve. (20) 8 years. (21) 6 times. (22) £3. 11s. 9d. (23) £687. 10s. (24) Tom has one marble more than John. (25) The Tory had a majority of 32 votes.

## XI. (a).

(1) £491. 7s. 2½d. (2) 384 miles. (3) 1752 soldiers. (4) £31. 15s. (5) 974 miles. (6) £4987. 11s. 7½d. (7) 832592. (8) £81058. 12s. 1d. (9) 556818. (10) £103465. 14s. 5½d. (11) 603240. (12) £46308. 17s. 5½d. (13) 1021694. (14) £68177. 7s. 7d. (15) 1279512. (16) £125954. 10s. 6½d. (17) 1695076. (18) £159727. 19s. 8d. (19) 1850634. (20) £37282. 15s. 10½d.

## XI. (b).

(1) £1703. 16s. 9¾d. (2) 1479 feet. (3) £6136. 2s. 6d. (4) 1167036 soldiers. (5) £1937700. (6) £200000. (7) 1248888. (8) £121587. 18s. 1¼d. (9) 835227. (10) £155198. 11s. 8¼d. (11) 904860. (12) £69468. 6s. 2¼d. (13) 1532541. (14) £102266. 1s. 4½d. (15) 1919268. (16) £188931. 15s. 9¾d. (17) 2542614. (18) £239591. 19s. 6d. (19) 2775951. (20) £55924. 3s. 9¾d.

## XI. (c).

(1) £3060. 3s. 8d. (2) 3576 feet. (3) £1287. 19s. 4d. (4) 1860 students. (5) 23040 grains. (6) 112 lbs. (7) 1665184. (8) £162117. 4s. 2d. (9) 1113636. (10) £206931. 8s. 11d. (11) 1206480. (12) £92617. 14s. 11d. (13) 2043388. (14) £136354. 15s. 2d. (15) 2559024. (16) £251909. 1s. 1d. (17) 3390152. (18) £319455. 19s. 4d. (19) 3701268. (20) £74565. 11s. 9d.

## XI. (d).

(1) £20199. 13s. 2¾d. (2) 1880 petals. (3) £13827. 14s. 2d. (4) 685 inches. (5) £4706. 16s. 8d. (6) 15340 yards. (7) 2081480. (8) £202646. 10s. 2¼d. (9) 1392045. (10) £258664. 6s. 1¾d. (11) 1508100. (12) £115772. 3s. 7¾d. (13) 2554235. (14) £170443. 8s. 11½d. (15) 3198780. (16) £314886. 6s. 4¼d. (17) 4237690. (18) £399319. 19s. 2d. (19) 4626585. (20) £93206. 19s. 8¼d.

## XI. (e).

(1) £28844. 1s. 7½d. (2) 2898 pages. (3) £12574. (4) 3174 inches. (5) £106. 3s. (6) 5280 feet. (7) 2497776. (8) £243175. 16s. 3d. (9) 1670454. (10) £310397. 3s. 4¼d. (11) 1809720. (12) £138926. 12s. 4¼d. (13) 3065082. (14) £204532. 2s. 9d. (15) 3838536. (16) £377863. 11s. 7½d. (17) 5085228. (18) £479183. 19s. (19) 5551902. (20) £111848. 7s. 7½d.

## XI. (f).

(1) £45008. 7s. 0½d. (2) 10080 minutes. (3) £4. 16s. 6½d. (4) 5236 inches. (5) 1 day. (6) 2240 lbs. (7) 2914072. (8) £283705. 2s. 3¼d. (9) 1948863.

- (10) £862130. 0s. 7½d. (11) 2111340. (12) £162081. 1s. 1½d. (13) 3575929.  
 (14) £238620. 16s. 6½d. (15) 4478292. (16) £440840. 16s. 10¾d. (17) 5932766.  
 (18) £559047. 18s. 10d. (19) 6477219. (20) £130489. 15s. 6¾d.

## XI. (g).

- (1) £46293. 9s. (2) 5280 feet. (3) £1. 10s. 2d. (4) 1896 inches.  
 (5) £14. 4s. (6) 383744 windows. (7) 3330368. (8) £324234. 8s. 4d.  
 (9) 2227272. (10) £413862. 17s. 10d. (11) 2412960. (12) £185235. 9s. 10d.  
 (13) 4086776. (14) £272709. 10s. 4d. (15) 5118048. (16) £503818. 2s. 2d.  
 (17) 6780304. (18) £638911. 18s. 8d. (19) 7402536. (20) £149131. 3s. 6d.

## XI. (h).

- (1) £48935. 19s. 5½d. (2) 3627 ninepins. (3) £118. 2s. 6d. (4) 1998 inches.  
 (5) £10500. (6) 1107 grains. (7) 3746664. (8) £364763. 14s. 4½d.  
 (9) 2505681. (10) £465595. 15s. 0¾d. (11) 2714580. (12) £208389. 18s. 6¾d.  
 (13) 4597623. (14) £306798. 4s. 1½d. (15) 5757804. (16) £566795. 7s. 5½d.  
 (17) 7627842. (18) £718775. 18s. 6d. (19) 8327853. (20) £167772. 11s. 5½d.

## XI. (i).

- (1) £58468. 18s. 11½d. (2) 7980 fingers. (3) £938. 15s. (4) 57860 hundreds.  
 (5) £10489. 18s. 4d. (6) 759640 tens. (7) 4162960. (8) £405293. 0s. 5d.  
 (9) 2784090. (10) £517328. 12s. 3½d. (11) 3016200. (12) £231544. 7s. 3½d.  
 (13) 5018470. (14) £340886. 17s. 11d. (15) 6397560. (16) £629772. 12s. 8½d.  
 (17) 8475380. (18) £798639. 18s. 4d. (19) 9253170. (20) £186413. 19s. 4½d.

## XII. (a)

- (1) £22. 10s. 11d. (2) £68419. 11s. 2½d. (3) £7686. 17s. 6d. (4) 76868750.  
 (5) £58. 2s. 1½d. (6) 38737500. (7) £137. 19s. 7½d. (8) 1379802081.  
 (9) £2383. 8s. 4d. (10) 5616 men. (11) 1176 sheep. (12) £18756.  
 (13) 6048 miles. (14) £11887. 9s. (15) 7072 miles. (16) £443748. (17) 7308 legs.  
 (18) 2646 legs. (19) 9160 toes. (20) Cost £6. 4s. 10½d.; sold for £7. 12s. 3d.;  
 profit £1. 7s. 4½d.

## XII. (b).

- (1) 40000. (2) 28420. (3) 7686. (4) 7 × 4080 by 3728. (5) £163696. 4s. 2½d.  
 (6) £16571. 1s. 5½d. (7) 0. (8) 258265. (9) £147043. 17s. 6d. (10) 4765230.  
 (11) £48797. 17s. 2½d. (12) 3029445. (13) £212846. 1s. 3d. (14) 25566255.  
 (15) £2946550. 1s. 6¾d.

## XIII.

- (1) 10 + 4, 9 + 5, 8 + 6, 7 + 7. (2) 10 + 5, 9 + 6, 8 + 7; 10 + 6, 9 + 7, 8 + 8;  
 10 + 7, 9 + 8; 10 + 8, 9 + 9; 10 + 9. (3) £59915. 11s. 11d. (4) 41354745.  
 (5) £13369. 10s. 4d. (6) 69743656. (7) £111235. 5s. 10½d. (8) 66323604.  
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 (13) £7. 18s. (14) £29. 12s. 6d. (15) 790000. (16) 2962500. (17) 499197911.

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inches. (58) 960 farthings. (59) 1601600 lbs. (60) 19210 feet. (61) 26448054.  
 (62) £7424. 13s. (63) £522. 7s. 6½d. (64) £563. 4s. 5½d. (65) £21. 4s. 10½d.  
 (66) £385. 8s. 3d. (67) £2. 6s. (68) £14. 14s. 10½d. (69) £17. 12s. 6d.  
 (70) 6s. 6d. per doz.; £130 on the whole. (71) £640. (72) £637. 7s. 2½d.  
 (73) £72. 12s. (74) He gained £36. 8s. 1d. (75) I gain £8. 19s. 4½d.  
 (76) £23. 2s. 7d. (77) £91. 12s. 6½d. (78) £30. 14s. 11¾d. (79) 215 yards.  
 (80) 430 yards. (81) 42 days. (82) 16 days. (83) 40 days. (84) £5. 5s. 4½d.  
 (85) £17. (86) 3s. 3d. (87) £1. 10s. 6d. (88) A profit of £86. 11s.  
 (89) 1407 yards. (90) 272 men. (91) 172 threepenny loaves. (92) 3383.  
 (93) 15704; 2388. (94) 117936. (95) 13930. (96) 2738880. (97) 362880.  
 (98) 2830668750. (99) £28306. 13s. 9d. (100) £4144. 15s. 3¾d. (101) £28350.  
 (102) 92866752. (103) 448218972. (104) 7791000. (105) 559482.

## XIX.

(1) 3 times. (2) 4 times. (3) 7 articles. (4) 8 weeks. (5) By 5. (6) 10 persons. (7) 8 days. (8) 9 strips. (9) 11 regiments. (10) 7 yards. (11) 4 times and £1. 4s. 8d. over. (12) 8 times and 8d. over. (13) 6 articles and 6s. 7d. over. (14) 10 months with £1. 5s. to spare. (15) 9s. 9d. (16) £1. 7s. (17) 13 months and 1 day over. (18) October 9th. (19) 5 periods. (20) 8 persons and £50. 1s. 4d. over.

## XX.

(1) 135 times. (2) 217 articles. (3) By 273. (4) 161 times. (5) 15 years. (6) £350 a-year. (7) 34 Napoleons. (8) 142 times. (9) 486 guineas. (10) 80 weeks. (11) 23 weeks. (12) 172 of each. (13) 108 times and £3. 17s. 3d. over. (14) 800 times and 10s. 1d. over. (15) 14s. 4d. a-week; 69 weeks and 11s. in hand; £21. 13s. 4d. (16) 1500 copies; £39. 1s. 3d. profit. (17) 45 omnibuses. (18) 66448 times and 6s. over. (19) 4s. 3d. (20) 30 shares. (21) 4090 times. (22) £485. (23) 139 Napoleons. (24) 60 lbs. of tea. (25) 408 times. (26) 123 times. (27) 1001 times. (28) 900 times. (29) 734 times. (30) 720 times. (31) 10000 times. (32) 126 times. (33) 999 times. (34) 2407 times. (35) 104 times and 13s. 4d. over. (36) 312 times and 8s. over. (37) 716 times and 2s. 3d. over. (38) 400 times and £5. 13s. 5d. over. (39) 730 times and £161. 6s. 8d. over. (40) 20751 times and ¾d. over. (41) 307 times and £1. 0s. 5d. over. (42) 1111 times and £4. 4s. 4½d. over. (43) 518 times and 1s. 7d. over. (44) 9999 times and £10. 8s. 3¾d. over.

## XXI.

(1) £8709. 14s. 4½d. (2) £36. 16s. 10½d. (3) £22807. 8s. 7½d. (4) £3673. 1s. 10d. (5) £877. 6s. 10½d. (6) £251. 15s. 3½d. (7) £1560. 17s. 4d. (8) £3800. 4s. 6½d. (9) £185. 3s. 4d. (10) £2. 8s. 2½d. (11) £2. 14s. 9d. (12) £12. 4s. 11½d. (13) 13s. 8½d. (14) £2. 8s. 5½d. (15) 18s. 7½d. (16) £35. 8s. 2¾d. (17) £173. 2s. 2½d. and ½d. over. (18) £3266. 9s. 11¾d. and ¾d. over. (19) £111. 2s. 2½d. and 1½d. over. (20) £49. 14s. 4½d. (21) £21875. 4s. 2d. (22) £438. 16s. 6½d. and ½d. over. (23) £1250. (24) £341. 5s. 8½d. and ¾d. over. (25) £175. 1s. 9d. (26) £150. 1s. 6d.

- (27) £131. 6s. 3½d. (28) £116. 14s. 6d. (29) £67. 12s. 5½d. and ¾d. over.  
 (30) £98. 17s. 7½d. and 4 farthings over.

## XXII.

- (1) 8706 things to each part. (2) 179 things. (3) 23745 things to each part.  
 (4) 24287. (5) 177784 things. (6) 274331. (7) 625 apples in each basket.  
 (8) 623369. (9) 88 miles to each stage. (10) 839. (11) 329 miles a-day.  
 (12) 795. (13) 427 lbs. (14) 17238. (15) 937 men. (16) 111112. (17) 8433  
 cartridges to each regiment. (18) 12345. (19) 507 pages. (20) 10203.  
 (21) 3517259 and 1 over; 2344839 and 2 over; 1758629 and 8 over; 1406903  
 and 4 over; 1172419 and 5 over; 1004931 and 2 over; 879314 and 7 over;  
 781613 and 2 over; 639501 and 8 over; 586209 and 11 over. (22) a. 83333  
 and 4 over. b. 349803 and 5 over. c. 3504166 and 8 over. d. 92592 and 7  
 over. e. 18968 and 9 over. f. 338750. g. 8833 and 4 over. h. 1416666 and  
 8 over. k. 754375. (23) £158. 19s. 9d. (24) 86799. (25) £333. 6s. 8d.  
 (26) 4789. (27) £429. 15s. 10½d. (28) 4250767. (29) £63. 11s. 4½d.  
 (30) 187 inches. (31) £729. 16s. 8d. (32) 2397. (33) £137. 9s. 3½d.  
 (34) 14367. (35) £2375. (36) 671377. (37) £42. 15s. 1½d. (38) 13717421.  
 (39) £3456. 7s. 8½d. (40) 17250.

## XXIII.

- (1) £47. 19s. 8½d. to each person. (2) £20. 15s. 0½d. (3) 15s. 9½d. to each  
 person. (4) 18s. 10d. (5) £6. 15s. 6d. and 268 farthings over. (6) £1. 7s. 10d.  
 a-day. (7) £20. 10s. 10½d. a-week. (8) £3. 15s. 0½d. to each part. (9) £43.  
 12s. 6d. (10) 8s. 5½d. per piece and 2½d. per yard. (11) 8492 and 8299 over.  
 (12) 10504 and 7832 over. (13) 1080 and 89640 over. (14) 456000 and 125  
 over. (15) 1300. (16) 4070200 and 21417 over. (17) 24 bags and 344 marbles  
 over. (18) 6186. (19) 2090. (20) £8. 7s. 3d. (21) £5. 13s. 9½d. a-week.  
 (22) £438. 16s. 6d. and 53 farthings over. (23) £11235. 19s. 1d. and 76 far-  
 things over. (24) £3745. 6s. 4½d. and 165 farthings over. (25) £535. 0s. 10½d.  
 and 1233 farthings over. (26) £107. 0s. 2d. and 6840 farthings over. (27) £11.  
 17s. 9½d. and 25530 farthings over. (28) £1. 1s. 7½d. and 614265 farthings  
 over. (29) 365 days. (30) 73 days. (31) 219 days. (32) £500 a-year.  
 (33) 2267 loads. (34) £28. 12s. (35) 5766 and 36997 over. (36) 74886  
 and 4171 over. (37) 7s. 6d. each article. (38) £1. 3s. 6½d. (39) 11s. 9½d.  
 (40) 11s. 9½d. (41) 29491 and 367 over. (42) 5040 and 166 over. (43) 8001.  
 (44) 7101 and 7100 over. (45) 853 and 20 over. (46) 853 and 40 over.  
 (47) 1613. (48) 5882 and 10 over. (49) 53163 and 3 over. (50) 27027 and 1  
 over. (51) 27027 and 3 over. (52) 47649 and 8100 over.

## XXIV.

- (1) 11637. (2) 922. (3) £100. (4) 7700. (5) 834. (6) 164. (7) £1410.  
 (8) 372. (9) 675. (10) 7232. (11) 12784. (12) 9257. (13) 16353.  
 (14) 107584. (15) 593216. (16) 260078. (17) 371. (18) 19788. (19) 601.  
 (20) 430. (21) 89. (22) 965419. (23) 91. (24) 91. (25) 9373.  
 (26) 476926.

## XXV.

- (1) 3316298. (2) 153646682. (3) 522559776. (4) 90469995. (5) 57554068  
 (6) 47849196. (7) 50810446. (8) 10224126746. (9) 166198320. (10) 344978010  
 (11) 33906778500. (12) 658180500. (13) 21014700. (14) 8060000000000.  
 (15) 64054063200. (16) 4048842000000. (17) 3154088574000.  
 (18) 2013694716600000. (19) 120824360. (20) 85301012000.  
 (21) 4170120000000. (22) 10809297400000.

## XXVI.

- (1) 421967. (2) 10290784. (3) 3127919176. (4) 777215736. (5) 7250510847.  
 (6) 4886948385.

## XXVII.

- (1) 7456064. (2) 96285424. (3) 912861150. (4) 1437211854. (5) 1853639099.  
 (6) 1372609378. (7) 52170000. (8) 1033042350. (9) 760136. (10) 141875540.  
 (11) 4313190. (12) 141543378. (13) 332934. (14) 72021197. (15) 23860577.  
 (16) 15802464. (17) 443098000. (18) 1715912000. (19) 13790400000.  
 (20) 3752000000.

## XXVIII.

- (1) 768875524. (2) 56399243901. (3) 2901053656358. (4) 63683190.  
 (5) 8513398256. (6) 1009239378. (7) 20703998546. (8) 26502969064.  
 (9) 6478427532. (10) 249023454. (11) 6310724148. (12) 861607109535.  
 (13) 25807878432. (14) 169978503. (15) 975139833. (16) 9026753133.  
 (17) 2908529336. (18) 548361180000. (19) 53724728890000.  
 (20) 3874393080000.

## XXIX.

- (1) 1092415023. (2) 2117922914. (3) 168412333. (4) 259594590.  
 (5) 1005726032. (6) 3088926. (7) 59044383. (8) 1757451150.  
 (9) 20046674000. (10) 216890000. (11) 885228000000. (12) 151156620000.  
 (13) 1941211. (14) 464797. (15) 11682629. (16) 4899167. (17) 6286020.  
 (18) 21372468. (19) 8481547. (20) 2896138.

## XXX.

- (1) 7224669228. (2) 2714028506. (3) 4423519690. (4) 382265550090.  
 (5) 12661237863. (6) 1268027663. (7) 128701643. (8) 1265938898630.  
 (9) 3332055981560. (10) 2606522886000. (11) 263580966000.  
 (12) 58573548000. (13) 94224778000. (14) 113990020000. (15) 8126102731.  
 (16) 33938429053. (17) 335082236143. (18) 51146646601. (19) 481352085301.  
 (20) 3346520307043.

## XXXI.

- (1) 86304318526. (2) 20892107831. (3) 596151520. (4) 17749233000.  
 (5) 149097032000. (6) 1180503560. (7) 2885933050000. (8) 267858500000.  
 (9) 968489223440. (10) 22865305512. (11) 12347610552160.  
 (12) 465150381000000. (13) 18016412822200. (14) 8437916698835000.  
 (15) 5625885888000. (16) 35790368434402439. (17) 73258546120800.  
 (18) 54601236863370. (19) 91454722359131250. (20) 764210045000000.

## XXXII. See VII.

## XXXIII.

- (1) 4334360. (2) 2894523. (3) 254800859. (4) 13764290. (5) 1928169.  
(6) 17216423. (7) 1891066. (8) 7232176. (9) 20334. (10) 9164031.

## XXXIV.

- (1) 1567535. (2) 39616387. (3) 708579977. (4) 4097454. (5) 1.  
(6) 4566329. (7) 90. (8) 274032. (9) 6000000. (10) 477054964.  
(11) 101010100. (12) 123456.

## XXXV.

- (1) 368 and 892 over. (2) 1554 and 7077 over. (3) £109. 11s. 2½d. and 267 farthings over. (4) £36. 2s. 2d. and 746 farthings over. (5) 15732 and 19532 over. (6) 29573 and 13937 over. (7) £7. 6s. 1¼d. and 2895 farthings over. (8) 10990 and 397 over. (9) 1269 and 26123 over. (10) 1177 and 74663 over. (11) 4534 and 10488 over. (12) 4000160 and 6 over. (13) £6744. 9s. 7½d. and 56665 farthings over. (14) 18543 and 13096 over. (15) 76923 and 1 over. (16) 5834602. (17) 2616. (18) £8. 3s. 5½d. (19) £50. 17s. 10½d. (20) 16359.

## XXXVI.

- (1) 36728653852. (2) 14731640784. (3) 30155696226. (4) 23375700.  
(5) 5562144280000. (6) 681499000. (7) 1843970520. (8) 2677856977521.

## XXXVII.

- (1) 4677. (2) £461. 9s. 10¼d. (3) 4567. (4) £25. 0s. 7d. (5) 4789.  
(6) £39. 14s. 0¾d. (7) 16945. (8) £772. 11s. 5¾d. (9) 3561. (10) £271. 0s. 9¾d. (11) 123456. (12) £117. 16s. 7¼d.

## XXXVIII.

- (1) 325796 and 8 over; 32579 and 68 over; 3257 and 968 over; 325 and 7968 over. (2) £868. 8s. 9d.; £86. 16s. 10½d.; £8. 13s. 8¼d.; 17s. 4¼d. and 7000 farthings over. (3) £3979. 3s. 4d.; £397. 18s. 4d.; £39. 15s. 10d.; £3. 19s. 7d.; 7s. 11¼d. (4) £243. 10s. 4¾d. and 28 farthings over. (5) £400. 0s. 0¼d. and 8528 farthings over. (6) 11s. 10¾d.

## XXXIX.

- (1) 32731 and 5 over. (2) £10153. 12s. 3¾d. and 14 farthings over. (3) 18367 and 34 over. (4) £10. 12s. 5¼d. and 59 farthings over. (5) 34090 and 34 over. (6) £358. 6s. 6d. (7) 299714 and 13 over. (8) £431. 15s. 0¾d. and 14 farthings over. (9) 99122 and 25 over. (10) £11904. 15s. 2¾d. and 36 farthings over. (11) 43699 and 73 over. (12) £389. 5s. 6¼d. and 34 farthings over.

## XL.

- (1) 15783 and 12 over. (2) 280304 and 16 over. (3) 210228 and 16 over.  
(4) 168182 and 36 over. (5) 4862106 and 61 over. (6) 139 and 52 over.  
(7) 8567670. (8) 29492. (9) 1508 and 13 over. (10) 1179 and 2343 over.  
(11) 43 and 1493200 over. (12) 719250. (13) 916 and 1317 over. (14) 4 and



4963421 over. (15) 69 and 2554000 over. (16) 2052920 and 400 over. (17) 201700. (18) 50003000. (19) 9751272 and 25 over. (20) 975127 and 125 over. (21) 97512 and 3625 over. (22) 9751 and 3625 over. (23) 97512 and 36250 over. (24) 975127 and 12500 over. (25) 9751272 and 25000 over.

## XLI.

(1) 9549025. (2) 46638900. (3) 97109625. (4) 184778625. (5) 172980000. (6) 448554750. (7) 10632375. (8) 1313250. (9) 240718125. (10) 7756200. (11) 35339250. (12) 633060750. (13) 6671875. (14) 5066796875. (15) 262406250000. (16) 1312500000000.

## XLII.

(1) 1101101. (2) 120202. (3) 122301. (4) 1420433. (5) 335052. (6) 66621. (7) 301227. (8) 810401. (9) 742073. (10) 420073. (11) 11001110; 1010000; 210000; 132222; 121110; 106665; 76664; 76663; 76662; 76661; 76660.

## XLIII.

(1) 1001011. (2) 21010. (3) 121101. (4) 2043. (5) 311131. (6) 255351. (7) 3653071. (8) 1805546. (9) 32638. (10) 81e4023t4. (11) 100111; 1201222; 2302333; 3403444; 4504555; 5605666; 6706777; 7807888; 8908999; 9t09ttt; te0teee.

## XLIV.

(1) 11011100111. (2) 11212121201. (3) 221233121112. (4) 1013113431. (5) 122451450. (6) 125210016. (7) 43706640. (8) 6336600000. (9) 2062488t. (10) 40992381. (11) 1100000.

## XLV.

(1) 1000 and 110 over. (2) 2202 and 1 over. (3) 103033 and 1 over. (4) 13244. (5) 11031 and 5 over. (6) 123502. (7) 621407. (8) 5127064. (9) 13706 and 1 over. (10) 688836 and 2 over.

## XLVI.

(1) 10000000000. (2) 1011001111. (3) 222122. (4) 33220. (5) 1011111000; 1001011; 23320; 11020; 3304; 2134; 1370; 1034; 760; 631; 534. (6) 10011111100101; 1001001112; 10333211; 1123303; 234405; 113426; 47745; 31045; 20453; 14404; et05. (7) 2792. (8) 6830. (9) 4852. (10) 11475. (11) 185. (12) 1244007. (13) 100. (14) 53062. (15) 1000002. (16) 1716218. (17) 12304624. (18) 100111; 10000; 2011; 1104; 514; 400; 314; 256; 213; 194.

## XLVII.

(1) £1041. 13s. 4d. (2) £4166. 13s. 4d. (3) £1028806. 11s. 8½d. (4) £61. 19s. 6d. (5) £321. 12s. 6d. (6) £283. 13s. (7) £45. 12s. 4½d.; £49. 17s. 11½d.; £668. 19s. 8½d.; £116. 10s.; £411. 1s. 3½d.; £66. 17s. 5d.

## XLVIII.

(1) 6 ft., 7 in. (2) 4 yds., 1 ft., 3 in. (3) 13 fathoms, 5 ft., 4 in. (4) 2 m., 8 fur., 160 yds. (5) 147 yds., 2 ft., 1 in.; 445 yds., 9 in.; 24 yds, 3 in.; 51

yds., 2 ft., 8 in. ; 123 yds. ; 65 yds. (6) 100 miles ; 568 m., 1 fur., 100 yds. ; 42 m., 4 fur., 112 yds. ; 9 m., 176 yds. (7) 7899 m., 2 fur., 16 yds.

## XLIX.

(1) 78 chains, 43 links. (2) 6 m., 59 chains, 84 links. (3) 21 m., 69 chains, 86 links. (4) 125 miles.

## L.

(1) 15 yds., 3 n. (2) 36 yds., 2 qrs., 3 n. (3) 64 yds.

## LI.

(1) 664 gals., 2 qts., 1 pt. (2) 625 gals. (3) 929 gals., 3 qts.

## LII.

(1) 26 qrs., 4 bus., 2 pks. (2) 21 qrs., 1 bus., 3 pks., 1 gal. (3) 15625 qrs.

## LIII.

(1) 3 reams, 12 quires, 22 sheets. (2) 7 reams, 17 quires. (3) 4 reams.

## LIV.

(1) 78 oz., 2 drs. (2) 32 oz. (3) 39 lbs., 1 oz. (4) 8 lbs., 7 drs. (5) 45 cwt. (6) 99 cwt., 23 lbs. (7) 44 tons, 12 cwt., 3 qrs., 12 lbs. (8) 11 tons, 5 cwt. (9) 50 tons. (10) 12 tons, 4 cwt., 3 qrs., 7 lbs.

## LV.

(1) 20 dwts., 20 grs. (2) 1 lb. (3) 1 lb., 2 oz., 11 dwts., 16 grs. (4) 27 lbs., 3 oz., 18 dwts., 17 grs.

## LVI.

(1) 285 in. (2) 16779 ft. (3) 70781 farthings. (4) 4000 sixpences. (5) 20 fourpenny-pieces. (6) 50 threepenny-pieces. (7) 315 sixpences. (8) 95999 farthings. (9) 79 crowns. (10) 420 half-crowns. (11) 3207 halfpence. (12) 17414 farthings. (13) 224000 lbs. (14) 14347 oz. (15) 2400 sheets. (16) 31536000 seconds. (17) 604800 beats. (18) 814 miles.

## LVII.

(1) 122 tons, 16 cwt., 3 qrs., 1 lb. (2) 1 lb., 11 oz., 3 dwts., 4 grs. (3) 54 m., 4 fur., 170 yds. (4) 2 days, 17 hrs., 38 min., 46 sec. (5) 9 tons, 1 cwt., 21 lbs. (6) 5 oz., 9 dwt., 20 grs. (7) 8 m., 6 fur., 203 yds. (8) 3 yds., 1 ft., 4 in. (9) 2639 tons, 3 cwt., 2 qrs. (10) 1391 lbs., 9 oz., 18 dwts., 8 grs. (11) 956 m., 4 fur., 100 yds. (12) 1000 times. (13) 310 times and 7 dwt., 22 grs. over. (14) 1 ton, 1 cwt., 2 qrs., 10 lbs. (15) 4 oz., 17 dwts., 12 grs. (16) 9 tons, 2 cwt., 1 qr., 14 lbs. and 17 lbs. over. (17) 3 fur., 108 yds. (18) 2 yds., 3 in. and 32 in. over. (19) 59' 10" and 250" over. (20) 582 copies and 6 sheets over.

## LVIII.

(1) 1, 2, 5, 10 ; —1, 2, 3, 4, 6, 12 ; —1, 2, 4, 8, 16 ; —1, 2, 4, 5, 10, 20 ; —1, 2, 3, 4, 6, 9, 12, 18, 36 ; —1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 ; —1, 2, 4, 5, 10, 20, 25, 50, 100 ; —1, 2, 4, 7, 8, 14, 16, 28, 56, 112 ; —1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120 ; —1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72, 144 ; —1,

2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 40, 48, 60, 80, 120, 240;—1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 40, 45, 60, 72, 90, 120, 180, 360;—1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 32, 40, 48, 60, 64, 80, 96, 120, 160, 192, 240, 320, 480, 960;—1, 2, 4, 5, 8, 10, 20, 25, 40, 50, 100, 125, 200, 250, 500, 1000;—1, 2, 4, 5, 8, 10, 11, 16, 20, 22, 32, 40, 44, 55, 80, 88, 110, 160, 176, 220, 352, 440, 880, 1760;—1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 30, 32, 36, 40, 45, 48, 60, 64, 72, 80, 90, 96, 120, 128, 144, 160, 180, 192, 240, 288, 320, 360, 384, 480, 576, 640, 720, 960, 1152, 1440, 1920, 2880, 5760;—1, 2, 4, 5, 7, 8, 10, 14, 20, 25, 28, 35, 40, 50, 56, 70, 100, 125, 140, 175, 200, 250, 280, 350, 500, 700, 875, 1000, 1400, 1750, 3500, 7000.

## LIX.

(1) 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97. (2) Prime, 113, 131; Composite, 91, 111, 117, 119, 121, 133.

## LX.

2, 3, 4, 6, 7, 8, 9, 12;—3, 5, 9;—3, 5, 7, 9;—2, 3, 4, 6, 7, 8, 12;—11;—2, 4, 8;—2, 7;—2, 3, 4, 5, 6, 8, 9, 10, 12;—3, 9, 11;—2, 3, 4, 6, 8, 9, 12;—2, 3, 4, 6, 8, 9, 12;—2, 3, 4, 6, 8, 12;—2, 3, 4, 5, 6, 9, 10, 12;—2, 4, 5, 8, 10, 11;—2, 3, 4, 6, 7, 8, 9, 11, 12;—3, 9, 11;—3, 7, 9, 11;—2, 3, 4, 5, 6, 7, 8, 9, 10, 12.

## LXI.

(1) 2;—2, 4, 5;—3, 5. (2) 5, 7;—none;—2, 4, 7, 8. (3) 2, 4, 5, 8;—2, 3, 4, 6, 7, 8;—2, 3, 6, 9. (4) 2, 11;—2, 7;—2, 3, 4, 6, 11.

## LXII.

(1)  $2 \times 3$ . (2)  $2^3$ . (3)  $3 \times 5$ . (4)  $2^4$ . (5)  $2^3 \times 3^2$ . (6)  $2^3 \times 5$ . (7)  $7 \times 13$ . (8)  $2^5 \times 3$ . (9)  $2^3 \times 3 \times 5$ . (10)  $11 \times 13$ . (11)  $2^4 \times 3 \times 5$ . (12)  $2^4 \times 3^2 \times 5$ . (13)  $2^3 \times 3 \times 5 \times 11$ . (14)  $2^5 \times 5 \times 11$ . (15)  $3^2 \times 5 \times 41$ . (16)  $2^7 \times 3^2 \times 5$ . (17)  $2^3 \times 5^2 \times 7$ . (18)  $2^2 \times 5 \times 11 \times 37$ . (19)  $2^3 \times 3^2 \times 11^2$ . (20)  $2^2 \times 3 \times 7 \times 11$ .

## LXIII.

Prime, 101, 1367, 1867, 4019; Composite,  $765 = 5 \times 3^2 \times 17$ ;  $169 = 13^2$ ;  $247 = 13 \times 19$ ;  $2109 = 3 \times 19 \times 37$ ;  $365 = 5 \times 73$ ;  $3059 = 7 \times 19 \times 23$ ;  $483 = 3 \times 7 \times 23$ ;  $99 = 3^2 \times 11$ ;  $999 = 3^3 \times 37$ ;  $9999 = 3^2 \times 11 \times 101$ ;  $99999 = 3^2 \times 41 \times 271$ ;  $999999 = 3^2 \times 7 \times 11 \times 13 \times 37$ .

## LXIV.

(1) 12. (2) 48. (3) 4. (4) 1. (5) 30. (6) 19. (7) 7. (8) 1. (9) 14. (10) 33. (11) 25. (12) 60.

## LXV.

(1) 16. (2) 110. (3) 40. (4) 4. (5) 28. (6) 77. (7) 120. (8) 180. (9) 140. (10) 42. (11) 135. (12) 352.

## LXVI.

(1) 317. (2) 37. (3) 105. (4) 519. (5) 8. (6) 1. (7) 151. (8) 413. (9) 113. (10) 99. (11) 809. (12) 345. (13) 107. (14) 179. (15) 769. (16) 127. (17) 83. (18) 135. (19) 352. (20) 142857.

## LXVII.

- (1) 23. (2) 59. (3) 97. (4) 41. (5) 113. (6) 101. (7) 59. (8) 67.  
 (9) 108. (10) 29. (11) 809. (12) 73. (13) 256. (14) 93. (15) 12.  
 (16) 20706.

## LXVIII.

- (1) 12. (2) 205. (3) 17. (4) 101. (5) 117. (6) 312. (7) 37. (8) 119.  
 (9) £7. 18s. 9d. (10) 114 days. (11) 1 ft., 7 in. square; 143 tiles.

## LXIX.

- (1) 30. (2) 45. (3) 66. (4) 21. (5) 90. (6) 6.

## LXX.

- (1) 180. (2) 300. (3) 1680. (4) 75. (5) 525. (6) 156. (7) 3285.  
 (8) 30000. (9) 150. (10) 690. (11) 119370. (12) 24000. (13) 900.  
 (14) 8010. (15) 1110. (16) 960. (17) 4664. (18) 11803. (19) 141036.  
 (20) 41123.

## LXXI.

- (1) 210. (2) 6. (3) 225. (4) 225. (5) 60. (6) 240. (7) 630. (8) 600.  
 (9) 32400. (10) 3600. (11) 59290. (12) 780.

## LXXII.

- (1) 720. (2) 2520. (3) 210. (4) 210. (5) 1260. (6) 27720. (7) 1155.  
 (8) 48. (9) 6630. (10) 600. (11) 9240. (12) 756. (13) 4620. (14) 323323.  
 (15) 78540. (16) 23069. (17) 27869. (18) 92796. (19) 14385. (20) 24000.  
 (21) 360 miles. (22) 1305 years. (23) 399 yards; 19 houses; 9 lamp-posts.

## LXXIII.

- (1) a.c.m. (a) 120, (b) 92, (c), 110, (d) 1, (e) 1, (f) 6; L.C.M. (a) 2400,  
 (b) 32844, (c) 40480, (d) 2070503, (e) 364500, (f) 1431144. The least multiplier  
 of the first to yield a multiple of the second: (a) 4, (b) 21, (c) 16, (d) 1867,  
 (e) 729, (f) 556. The least multiplier of the second to yield a multiple of the  
 first: (a) 5, (b) 17, (c) 23, (d) 1109, (e) 500, (f) 429. (2) (a) £21, (b) £5. 5s.,  
 (c) £7. 17s. 6d. (3) 144 lb. av. or 175 lb. troy. (4) 11 lb. of coffee. (5)  
 13s. 9d. (6) 5 turns of the larger, 8 of the smaller, and 600 contacts.

## LXXIV.

- (1) 2 lb. at 5½d. with 3 lb. at 3d. (2) 1 lb. of each. (3) 1 lb. at 3s. 4½d.  
 with 3 lb. at 1s. 10½d. (4) 11 casks at £1. 3s. 9¾d. with 5 casks at 14s. 9¾d.  
 (5) 1½ tons at £15. 2s. 6d. with 13 cwts. at £1. 11s. 3d. (6) 4 lbs. at 5½d. with  
 3 lb. at 1s. 2½d. (7) 50 days. (8) 24 gallons of spirits with 11 gallons of water.  
 (9) 8 gallons of spirits with 9 gallons of water.

## CHAPTER XII.

- § 1. (1) £16. 3s. (2) £4. 6s. 5½d. (3) 85 days. (4) £18. 15s. 4½d.  
 (5) 10s. 6d. (6) £1. 2s. 6d. (7) £1. 11s. 8d. (8) 4s. 7½d. (9) £2. 11s. 3d.  
 (10) £16. 17s. 0½d. (11) 96 days. (12) 10 oz. (13) £19. 7s. 11¼d. (14) £1.  
 19s. 0¾d. (15) £20. 12s. 6d. (16) £5. 1s. (17) 90 miles. (18) £13. 2s. 6d.  
 (19) £67. 10s. (20) £4. 4s. 2d.

§ 2. (1)-65. (2) 1204. (3) 81107. (4) 81107. (5) 3438. (6) 3438. (7) 2724. (8) 4032. (9) 4032. (10) 1298. (11) 1748. (12) 1809. (13) 1809. (14) 148762320. (15) 148762320. (16) 117024. (17) 14852. (18) 1515. (19) 5217. (20) 2043. (21) 107. (22) 593. (23) 668304. (24) 397506. (25) 278256. (26) 10584 times. (27) £29. 8s. 4½d. (28) £1195. 7s. 10d. (29) 285190. (30) 4527. (31) 1425600. (32) 1. (33) £1486. 11s. 3d.

§ 3. (1) 3206224 persons. (2) 30427065760 gallons. (3) 135835115 tons. (4) 40836. (5) 121 square miles and 557 acres over. (6) £2221602. 12s. 9d. (7) £109001 increase. (8) £247366640. (9) A's share, £5220. 15s. 6d.; B's, C's and D's, £3259. 14s. 10d. each. (10) 2917 voters. (11) Widow, £31853. 9s.; daughter, £23890. 1s. 9d.; each son, £19908. 8s. 1½d. (12) £530. 11s. (13) A pays B £3. 7s. 4½d. (14) 45 years. (15) 13158 feet. (16) 11s. 10d. (17) 11 years. (18) £24. 10s.; £18. 7s. 6d. (19) 5d. per lb. (20) £380. (21) £1. 11s. 8d. (22) £514. 1s. 3d. (23) 19200 times. (24) 2s. 11d. (25) A will have £35. 14s.; B, £25. 4s.; C and D, £19. 19s. each. (26) 300 articles. (27) Each man has £21; each woman, £7; each boy, £3. 10s. (28) £4. 16s. 8d. profit. (29) 5 rupees at 2s. 3d. each. (30) 413. (31) £4. 16s. 6d. (32) 33 oxen and £5. 8s. over. (33) 1407 francs. (34) £44. (35) 16200 shares. (36) £378. (37) £281. 5s.; £284. 1s. 3d.; £286. 17s. 6d.; £289. 13s. 9d.; £292. 10s.; £295. 6s. 3d.; £298. 2s. 6d. (39) 14402; 14559. (40) £3. (41) 7s. 8d. per gallon. (42) £42. (43) £1 loss; 6s. gain. (44) £11. 11s. (45) 1 ton, 16 cwt., 2 qrs., 9 lbs. (46) 16 men. (47) 15665 fathoms. (48) 3549 weeks. (49) 3 drs., 1 scr., 15 grs. (50) £55. 2s. 6d. (51) £67. 9s. 4d. (52) 27 seats. (53) 160 sovs. (54) 3 cwt., 1 qr., 5 lbs. (55) 6 hrs., 40 min. (56) £2263. 10s. (57) Spring, 92 d., 20 hrs., 32 m.; Summer, 93 d., 14 hrs., 24 m.; Autumn, 89 d., 17 h., 55 m.; Winter, 89 d., 0 h., 57 min. (58) 7½d. (59) 100 of each kind. (60) 135 doses. (61) He gained £402. 7s. 6d. (62) £2. 6s. 10d. (63) £3696000. (64) 66. (65) 74 tons, 18 cwt., 1 qr., 1 lb. (66) 1, 3, 5, 11, 13, 15, 33, 39, 55, 65, 143, 165, 195, 429, 715, 2145. (67) 7s. each. (70) 648 coins. (71) 1, 2, 3, 6, 11, 22, 33, 66, 121, 242, 363, 726. (73) £5. 6s. 8d. per share. (74) He will have to pay £2129. 3s. 4d., and loses in all £3954. 3s. 4d. (75) 3 years, 16 days, 2 hours, 40 minutes. (76) 48 miles an hour. (77) A has £2903. 0s. 5d.; B has £2334. 6s. 1d.; C has £1605. 7s. 11d. (78) 57 min. (80) For 2 and 3, the last figure; for 4, the last two figures; for 5, the sum of the digits. (82) 360 weeks. (83) 4774 guineas, 6s.; £5263. 13s. (85) 8; 2003. (86) 614125. (87) £119. 17s. 9½d.; £7787. 10s. (88) 4020 yards. (89) 277 articles. (90) £1. 15s. 6d. each. (91) 6 hrs., 15 min. (92) In 5 hours; 85 miles from London. (93) House, £1668; furniture, £417. (94) 44° 45' 24". (95) 112423; 2469. (96) 4515154. (97) £797. 10s. (98) 120 times. (99) 33400 admissions. (100) £1000.

THE SCIENCE AND ART  
OF  
ARITHMETIC;

*For the Use of Schools.*

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PART II. VULGAR FRACTIONS.

PART III. APPROXIMATE CALCULATIONS.

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BY

A. SONNENSCHN

AND

H. A. NESBITT, M.A., UNIV. COLL., LONDON.

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ANSWERS TO THE EXERCISES  
*IN THE SECOND EDITION.*

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# ANSWERS.

## PART II. VULGAR FRACTIONS.

### I.

£28. 17s. 6d., £19. 5s., £14. 8s. 9d., £11. 11s., £9. 12s. 6d.,  
£8. 5s., £7. 4s. 4½d., £6. 8s. 4d., £5. 15s. 6d., £5. 5s., £4. 16s. 3d.

### II.

(1) £131. 16s. 11d. (2) £778. 8s. 1½d. (3) £9. 7s. 1½d.  
(4) £834. 15s. 10d. (5) £382. 15s. 0¾d. (6) £217. 5s. 11½d.  
(7) £3575. 1s. (8) £19193. 14s. 10¾d. (9) £222. 14s. 0¾d.  
(10) £3286. 1s. 6¾d. (11) £10. 18s. 3¾d. (12) £40. 5s. 3½d.

### III.

(1) 1408 yds., or 6 fur. 88 yds. (2) 140 yds. (3) 11 cwt. 1 qr.  
20 lbs. (4) 4 oz. 10 dwt. (5) £1. 10s. 2d. (6) £1. 0s. 7½d.  
(7) 20 lbs. to each. (8) 700 yds., or 3 fur. 40 yds. (9) £7.  
(10) £536. 13s. 4d. (11) 10s., 6s. 8d., 13s. 4d., 5s., 15s., 4s., 8s.,  
12s., 16s., 3s. 4d., 16s. 8d., 2s. 6d., 7s. 6d., 12s. 6d., 17s. 6d., 2s.,  
1s. 8d., 1s. 4d., 1s. 3d., 1s. (12) 6d., 4d., 8d., 3d., 9d., 2d., 10d.,  
1½d., 4½d., 7½d., 10½d., 1d.

### IV.

(1)  $\frac{5}{2}$ . (2)  $\frac{7}{2}$ . (3)  $\frac{23}{3}$ . (4)  $\frac{35}{4}$ . (5)  $\frac{193}{15}$ . (6)  $\frac{1697}{20}$ . (7)  $\frac{88821}{97}$ .  
(8)  $\frac{467}{10}$ . (9)  $\frac{4617}{100}$ . (10)  $\frac{4607}{100}$ . (11)  $\frac{41583}{1000}$ . (12)  $\frac{41083}{1000}$ .  
(13)  $\frac{41003}{1000}$ . (14)  $\frac{410003}{10000}$ . (15)  $\frac{160197}{100}$ . (16)  $\frac{25000083}{5000}$ .  
(17)  $\frac{3323}{33}$ . (18)  $\frac{150014}{15}$ . (19)  $\frac{2100783}{700}$ . (20)  $\frac{7299}{99}$ .

### V.

(1)  $9\frac{1}{2}$ . (2)  $14\frac{1}{3}$ . (3)  $14\frac{3}{4}$ . (4) 10. (5)  $27\frac{2}{3}$ . (6) 23. (7)  $19\frac{30}{21}$ .  
(8)  $34\frac{6}{17}$ . (9)  $7\frac{259}{467}$ . (10)  $3\frac{7}{10}$ . (11)  $15\frac{8}{10}$ . (12)  $51\frac{9}{10}$ . (13)  $843\frac{1}{10}$ .  
(14)  $1259\frac{4}{10}$ . (15) 30000. (16)  $64859\frac{7}{10}$ . (17)  $6485\frac{9}{100}$ .  
(18)  $648\frac{597}{1000}$ . (19)  $64\frac{8597}{10000}$ . (20)  $6\frac{48597}{100000}$ .



## VI.

- (1)  $11\frac{1}{2}$ . (2)  $32\frac{3}{4}$ . (3)  $135\frac{3}{4}$ . (4)  $2320\frac{3}{4}$ . (5)  $28\frac{1}{17}$ . (6) 1087.  
 (7)  $89\frac{1}{2}$ . (8) 89. (9)  $89\frac{4}{28}$ . (10)  $88\frac{1}{2}$ . (11)  $88\frac{3}{4}$ . (12)  $271\frac{2}{10}$ .  
 (13)  $773\frac{5}{100}$ . (14)  $87\frac{2}{100}$ . (15)  $38\frac{633}{1000}$ . (16)  $1223\frac{1}{10}$ .  
 (17)  $1223\frac{4}{10}$ . (18) 1223. (19)  $1222\frac{7}{10}$ . (20)  $1222\frac{1}{10}$ . (21)  $623\frac{1}{10}$ .  
 (22)  $3405\frac{1}{10}$ . (23)  $3405\frac{6}{11}$ . (24)  $3404\frac{7}{11}$ . (25)  $3404\frac{5}{11}$ . (26)  $25\frac{3}{11}$ .  
 (27)  $82\frac{1}{17}$ . (28)  $24\frac{4}{100}$ . (29)  $1076\frac{24}{100}$ . (30)  $339\frac{158}{100}$ . (31)  $4\frac{4}{10}$ .  
 (32)  $52\frac{1}{2}$ . (33) 44.

## VII.

- (1)  $\frac{7}{10}, \frac{11}{10}, \frac{11}{10}, \frac{11}{10}, \frac{21}{10}, \frac{21}{10}, \frac{31}{10}, \frac{31}{10}, \frac{31}{10}$ . (2)  $\frac{11}{10}, \frac{11}{10}, \frac{11}{10}, \frac{11}{10}, \frac{11}{10}$ .  
 $\frac{11}{10}, \frac{128}{100}, \frac{130}{100}, \frac{15}{10}, \frac{21}{10}, \frac{21}{10}, \frac{31}{10}$ . (3)  $\frac{5}{10}, \frac{11}{10}, \frac{123}{100}, \frac{21}{10}, \frac{21}{10}, \frac{21}{10}$ .  
 $\frac{31}{10}, \frac{31}{10}, \frac{41}{10}, \frac{41}{10}, \frac{41}{10}, \frac{61}{10}, \frac{71}{10}, \frac{91}{10}, \frac{141}{10}, \frac{291}{10}$ . (4)  $\frac{41}{10}, \frac{11}{10}, \frac{11}{10}$ .  
 $\frac{11}{10}, \frac{21}{10}, \frac{31}{10}, \frac{31}{10}, \frac{31}{10}, \frac{31}{10}, \frac{41}{10}, \frac{81}{10}, \frac{101}{10}, \frac{121}{10}, \frac{211}{10}$ . (5)  $\frac{11}{10}, \frac{131}{10}, \frac{151}{10}$ .  
 $\frac{21}{10}, \frac{231}{10}, \frac{31}{10}, \frac{31}{10}, \frac{41}{10}, \frac{41}{10}, \frac{41}{10}, \frac{51}{10}, \frac{51}{10}, \frac{51}{10}, \frac{91}{10}, \frac{141}{10}, \frac{181}{10}, \frac{231}{10}$ .  
 $\frac{281}{10}, \frac{321}{10}, \frac{371}{10}, \frac{471}{10}, \frac{561}{10}$ . (6)  $9, 13\frac{1}{2}, 18, 22\frac{1}{2}, 27, 31\frac{1}{2}, 36, 40\frac{1}{2}$ .  
 45. (7)  $22\frac{1}{10}, 34\frac{1}{10}, 45\frac{1}{10}, 56\frac{1}{10}, 68\frac{1}{10}, 79\frac{1}{10}, 90\frac{1}{10}, 102\frac{1}{10}, 113\frac{1}{10}$ .  
 (8)  $236\frac{1}{10}, 473\frac{1}{10}, 592\frac{1}{10}, 828\frac{1}{10}, 1302\frac{1}{10}, 2368\frac{1}{10}, 2842\frac{1}{10}$ .  
 $2960\frac{1}{10}, 11841\frac{1}{10}, 59209\frac{1}{10}$ . (9) £1. 13s. 9d. (10)  $3\frac{1}{2}$  loads.  
 (11)  $16\frac{1}{2}$  bushels,  $9\frac{1}{2}$  bushels. (12) £9. 13s. 4d.

## VIII.

- (1)  $\frac{15}{10}, \frac{5}{10}, \frac{15}{10}, \frac{3}{10}, \frac{15}{10}, \frac{15}{10}, \frac{15}{10}$ . (2)  $\frac{10}{10}, \frac{20}{10}, \frac{5}{10}, \frac{4}{10}, \frac{20}{10}, \frac{20}{10}$ .  
 (3)  $\frac{50}{10}, \frac{100}{10}, \frac{25}{10}, \frac{20}{10}, \frac{100}{10}, \frac{10}{10}, \frac{5}{10}, \frac{1}{10}$ . (4)  $2\frac{1}{2}, 1\frac{1}{4}, 1\frac{1}{5}, 1\frac{1}{10}$ .  
 $\frac{3}{4}, \frac{21}{10}$ . (5)  $19\frac{1}{2}, 12\frac{1}{2}, 9\frac{1}{2}, 7\frac{1}{2}, 6\frac{1}{2}, 5\frac{1}{2}, 4\frac{1}{2}, 3\frac{1}{2}, 1\frac{1}{2}$ . (6)  $711\frac{1}{10}$ .  
 $474\frac{1}{10}, 355\frac{1}{10}, 284\frac{1}{10}, 237\frac{1}{10}, 203\frac{1}{10}, 177\frac{1}{10}, 158\frac{1}{10}, 142\frac{1}{10}, 129\frac{1}{10}$ .  
 $118\frac{1}{10}$ .

## IX.

- (1)  $11\frac{1}{10}, 2\frac{1}{10}, 3\frac{1}{10}, 4\frac{1}{10}, 4\frac{1}{10}, 5\frac{1}{10}, 6\frac{1}{10}, 20\frac{1}{10}, 28\frac{1}{10}, 144\frac{1}{10}$ .  
 $\frac{71}{10}, \frac{48}{10}, \frac{31}{10}, \frac{144}{10}, \frac{144}{10}, \frac{18}{10}, \frac{18}{10}, \frac{144}{10}, \frac{12}{10}, \frac{9}{10}, \frac{9}{10}, \frac{9}{10}$ .  
 (2)  $17\frac{1}{10}, 26\frac{1}{10}, 35\frac{1}{10}, 62\frac{1}{10}, 98\frac{1}{10}, 107\frac{1}{10}, 690\frac{1}{10}, 437\frac{1}{10}, 217\frac{1}{10}, 2\frac{1}{10}$ .  
 $\frac{161}{10}, \frac{171}{10}, \frac{1151}{10}, \frac{69}{10}, \frac{30}{10}, \frac{3}{10}$ . (3)  $\frac{6}{10}, \frac{4}{10}, \frac{3}{10}, \frac{12}{10}, \frac{2}{10}, \frac{12}{10}, \frac{12}{10}, \frac{12}{10}, \frac{12}{10}$ .  
 (4)  $430\frac{1}{10}, 286\frac{1}{10}, 215\frac{1}{10}, 172\frac{1}{10}, 143\frac{1}{10}, 122\frac{1}{10}, 107\frac{1}{10}, 95\frac{1}{10}, 86\frac{1}{10}$ .  
 (5)  $50\frac{1}{2}$  English miles. (6)  $1681\frac{67}{100}, 1891\frac{79}{100}, 1513\frac{11}{100}, 1576\frac{29}{100}$ .  
 $1961\frac{577}{100}, 1765\frac{505}{100}$ . (7)  $37\frac{1}{2}$  yds. (8)  $1\frac{1}{2}$  cwt.,  $\frac{1}{4}$  cwt. (9)  $9\frac{1}{2}$  lbs.  
 (10)  $1\frac{1}{10}$  yds. (11)  $24\frac{1}{10}, 16\frac{1}{10}, 12\frac{1}{10}, 9\frac{1}{10}, 7\frac{1}{10}, 4\frac{1}{10}, 1\frac{1}{10}$  gallons.  
 (12)  $7\frac{1}{2}, 11\frac{1}{2}, 15\frac{1}{2}, 19\frac{1}{2}, 23$  miles.

## X.

- (1) 5. (2) 19. (3) 2485. (4) 34. (5) 197. (6) 28767.  
(7) 60, 120, 180. (8) 250, 375, 625.

## XI.

- (1) 1760, 880, 440, 352, 220, 160, 110 times. (2) 22, 16, 10,  
4 times. (3) 6 turns. (4) 16 times. (5) 10 people.

## XII.

- (1)  $1\frac{1}{8}$ ,  $\frac{3}{8}$  bus. (2)  $75\frac{332}{108}$ . (3) £5; 24 days. (4) 16s. 3d.  
(5) £100. 17s.  $11\frac{3}{4}$ d. (6)  $5\frac{17}{8}$ ,  $8\frac{8}{8}$ ,  $10\frac{34}{8}$ ,  $13\frac{5}{8}$ ,  $16\frac{16}{8}$ ,  $19\frac{1}{8}$ ,  $21\frac{33}{8}$ ,  
 $24\frac{34}{8}$ ,  $27\frac{15}{8}$ , 96. (7)  $1\frac{13}{8}$ ,  $\frac{33}{8}$ ,  $\frac{24}{8}$ ,  $\frac{96}{8}$ ,  $\frac{16}{8}$ ,  $\frac{96}{8}$ ,  $\frac{12}{8}$ ,  $\frac{96}{8}$ ,  $\frac{96}{8}$ ,  
(8) 96, 12, 4, 2 times. (9) £4563. 8s. 4d., £1955. 15s. (10) 800  
trusses. (11)  $48\frac{6}{11}$ . (12) 1068 times. (13)  $87\frac{8}{9}$  yds. (14) 345 yds.  
(15) 1863 yds.

## XIII.

- (1)  $\frac{4}{8}$ . (2)  $\frac{3}{4}$ . (3)  $\frac{6}{11}$ . (4)  $\frac{2}{3}$ . (5)  $\frac{1}{4}$ . (6)  $\frac{3}{8}$ . (7)  $\frac{7}{8}$ .  
(8)  $\frac{3}{4}$ . (9)  $\frac{13}{17}$ . (10)  $\frac{25}{48}$ . (11)  $\frac{6}{11}$ . (12)  $\frac{13}{16}$ . (13)  $\frac{3}{8}$ . (14)  $\frac{34}{25}$ .  
(15)  $\frac{7}{30}$ . (16)  $\frac{7}{80}$ . (17)  $\frac{7}{16}$ . (18)  $\frac{28}{125}$ . (19)  $\frac{8}{9}$ . (20)  $\frac{27}{91}$ .  
(21)  $\frac{11}{13}$ . (22)  $\frac{17}{38}$ . (23)  $\frac{32}{767}$ . (24)  $\frac{1}{4}$ . (25)  $\frac{97}{117}$ . (26)  $\frac{212}{313}$ .  
(27)  $\frac{349}{481}$ . (28)  $\frac{3}{11}$ . (29)  $\frac{11}{25}$ . (30)  $\frac{35}{47}$ . (31)  $\frac{769}{848}$ . (32)  $\frac{111}{112}$ .  
(33)  $\frac{11}{12}$ . (34)  $\frac{79}{91}$ . (35)  $\frac{110187}{13096} = 8\frac{5419}{13096}$ . (36)  $\frac{8}{13}$ . (37)  $\frac{144}{173}$ .  
(38)  $\frac{63}{84}$ . (39)  $\frac{167}{338}$ . (40)  $\frac{2}{3}$ . (41)  $\frac{7}{11}$ . (42)  $\frac{2}{27}$ . (43)  $\frac{1}{37}$ .  
(44)  $\frac{70}{1111}$ . (45)  $\frac{13}{909}$ . (46)  $\frac{10}{11}$ . (47)  $\frac{80}{11111}$ . (48)  $\frac{80}{2439}$ .  
(49)  $\frac{110}{369}$ . (50)  $\frac{8}{1287}$ . (51)  $\frac{65}{999}$ . (52)  $\frac{73}{89}$ . (53)  $\frac{2}{5}$  to the boys,  
 $\frac{3}{5}$  to the girls. (54) A  $\frac{5}{48}$ , B  $\frac{2}{15}$ , C  $\frac{3}{20}$ , together  $\frac{31}{80}$ .

## XIV.

- (1) £806. 0s. 6d. (2) £1716. 19s. 2d. (3) £858. 7s.  $2\frac{1}{4}$ d.  
(4) £18. 6s.  $0\frac{1}{2}$ d. (5) £9. 9s. 1d. (6) £15. 6s. 4d.

## XV.

- (1)  $1\frac{1}{2}$ . (2)  $\frac{3}{4}$ . (3)  $1\frac{2}{7}$  to each person. (4)  $\frac{7}{10}$  to each person.  
(5)  $\frac{3}{4}$  to each person. (6)  $1\frac{1}{3}$  to each part. (7)  $2\frac{2}{3}$  to each person.  
(8)  $13\frac{1}{2}$  inches.

## XVI.

- (1)  $45\frac{14}{387}$ . (2)  $123\frac{3}{17}$ . (3)  $1142\frac{2}{11}$ . (4)  $2710\frac{4}{11}$ . (5)  $1918\frac{44}{11}$ .  
(6)  $615\frac{5}{18}$ . (7)  $\frac{39}{123}$ . (8)  $367\frac{22}{73}$ . (9)  $957\frac{17}{28}$ . (10)  $\frac{11}{17}$ . (11)  $63\frac{7}{7}$ .  
(12)  $1739\frac{5}{42}$ . (13)  $2647\frac{594}{1517}$ . (14)  $7\frac{1667}{2400}$ . (15)  $46\frac{78}{337}$ .  
(16)  $74\frac{3}{55}$ . (17)  $\frac{73}{350}$ . (18)  $4\frac{58}{73}$ .

## XVII.

(1) £2308. 16s.  $8\frac{1}{2}d.$ , £1539. 4s.  $5\frac{3}{4}d.$ , £1154. 8s.  $4\frac{1}{2}d.$ , £923. 10s.  $8\frac{1}{2}d.$ , £769. 12s.  $2\frac{5}{8}d.$ , £659. 13s.  $4\frac{1}{2}d.$ , £577. 4s.  $2\frac{1}{2}d.$ , £513. 1s.  $5\frac{5}{8}d.$ , £461. 15s.  $4\frac{1}{10}d.$  (2) £271. 12s.  $6\frac{1}{17}d.$ , £30. 11s.  $7\frac{5}{11}d.$ , £12. 11s.  $7\frac{2}{3}d.$ , 15s.  $6\frac{5}{8}d.$  (3) £109. 18s.  $10\frac{3}{8}d.$ , £73. 5s.  $11\frac{8}{9}d.$ , £54. 19s.  $5\frac{2}{3}d.$ , £42. 15s.  $1\frac{5}{108}d.$  (4) £1907. 13s.  $1\frac{3}{8}d.$ , £1271. 15s.  $4\frac{1}{12}d.$ , £953. 16s.  $6\frac{1}{16}d.$ , £763. 1s.  $2\frac{1}{8}d.$ , £635. 17s.  $8\frac{1}{4}d.$ , £545. 0s.  $10\frac{1}{2}d.$ , £476. 18s.  $3\frac{1}{3}d.$ , £423. 18s.  $5\frac{2}{3}d.$ , £381. 10s.  $7\frac{1}{10}d.$  (5) £224. 8s.  $7\frac{5}{8}d.$ , £25. 5s.  $4\frac{4}{10}d.$ , £10. 7s.  $11\frac{9}{148}d.$ , 12s.  $10\frac{1}{23}d.$  (6) £90. 16s.  $9\frac{1}{16}d.$ , £60. 11s.  $2\frac{1}{8}d.$ , £45. 8s.  $4\frac{3}{8}d.$ , £35. 6s.  $6\frac{2}{3}d.$  (7) £13. 3s.  $5\frac{1}{2}d.$ , £13. 3s.  $5\frac{1}{8}d.$ , £13. 3s.  $5\frac{1}{8}d.$ , £13. 3s.  $5\frac{1}{8}d.$  (8) £489. 12s.  $5\frac{1}{11}d.$ , £489. 12s.  $5\frac{1}{11}d.$ , £489. 12s.  $5\frac{1}{11}d.$  (9)  $81\frac{1}{3}d.$  (10) 9s.  $2\frac{1}{8}d.$ , 18s.  $4\frac{1}{2}d.$ ,  $7\frac{1}{2}d.$

## XVIII.

(1) 5s.  $4\frac{2}{3}d.$  (2) 1 qr. 2 lbs. (3)  $9\frac{9}{14}$  inches. (4) 3 fur. 86 yds. 2 ft., or  $746\frac{2}{3}$  yds.

## XIX.

(1)  $\frac{14}{88}$ . (2)  $\frac{5}{9}$ . (3)  $\frac{9}{10}$ . (4) 1. (5)  $\frac{5}{8}$ . (6)  $1\frac{173}{827}$ . (7)  $26\frac{3}{5}$ . (8)  $3\frac{1}{80}$ . (9)  $\frac{1}{81}$ . (10) 1. (11)  $\frac{1}{8}$ . (12)  $8\frac{2}{11}$ . (13)  $\frac{4}{7}$ . (14)  $\frac{1}{720}$ . (15)  $\frac{1}{18}$ . (16) 1. (17)  $\frac{1}{100000}$ . (18)  $\frac{1}{210}$ . (19)  $\frac{1}{10}$ . (20)  $6\frac{6}{8}$ . (21)  $\frac{216}{885}$ . (22)  $\frac{64}{729}$ . (23)  $\frac{4}{27}$ . (24)  $7\frac{1}{5}$ . (25)  $\frac{815}{710}$ . (26) 29. (27) 1. (28)  $4\frac{8}{13}$ . (29) 4. (30)  $46\frac{2}{3}$ . (31)  $\frac{51}{710}$ . (32)  $\frac{3}{4}$ . (33)  $\frac{1}{15}$ . (34) 8. (35)  $\frac{1}{6}$ . (36)  $\frac{3}{4}$ .

## XX.

(1) 16s. 8d. (2) 11s.  $5\frac{1}{2}d.$  (3) 16 dwt. 16 grs. (4) 2 ft. 6 in. (5) £1. 8s. 4d. (6) 19s.  $5\frac{3}{4}d.$  (7) 1 oz. 8 dwts. 8 grs. (8) 1 yd. 1 ft. 3 in. (9) £3. 12s.  $11\frac{1}{2}d.$  (10) 7s. (11) 1 oz. 1 dwt.

## XXI.

(1)  $1\frac{19}{30}$ ,  $1\frac{5}{8}$ ,  $\frac{3}{8}$ ,  $\frac{1}{8}$ ,  $\frac{26}{88}$ ,  $\frac{49}{80}$ ,  $\frac{37}{48}$ . (2)  $19\frac{1}{16}$ ,  $5\frac{7}{16}$ ,  $113\frac{7}{32}$ ,  $57\frac{3}{8}$ . (3)  $1\frac{17}{80}$ ,  $2\frac{4}{80}$ ,  $3\frac{1}{16}$ . (4)  $85\frac{83}{800}$ . (5)  $139\frac{47}{88}$ . (6) 1194,  $1194\frac{5}{13}$ ,  $1193\frac{1}{12}$ ,  $1193\frac{7}{13}$ ,  $1193\frac{17}{36}$ . (7)  $221\frac{383}{8400}$ . (8)  $10\frac{3}{77}$ ,  $341\frac{107}{1320}$ ,  $248\frac{2}{13}$ . (9)  $1\frac{341}{2520}$ ,  $7\frac{179}{2520}$ . (10)  $\frac{1}{5}$ ,  $\frac{1}{12}$ ,  $\frac{1}{20}$ ,  $\frac{1}{30}$ ,  $\frac{1}{42}$ ,  $\frac{1}{56}$ ,  $\frac{1}{72}$ ,  $\frac{1}{90}$ . (11)  $1\frac{35}{128}$ ,  $1\frac{23}{128}$ . (12)  $101\frac{37}{154}$ ,  $2\frac{81}{154}$ ,  $114\frac{47}{154}$ ,  $9\frac{44}{154}$ . (13)  $\frac{25}{80}$ ,  $\frac{23}{80}$ . (14)  $\frac{1}{4}$ ,  $\frac{1}{12}$ ,  $2\frac{1}{132}$ . (15)  $165\frac{5}{14}$ . (16)  $29\frac{209}{240}$ . (17)  $1\frac{92}{33}$ . (18)  $21\frac{3}{8}$ . (19)  $6\frac{23}{80}$ . (20) a.  $\frac{759}{30000}$ ,  $\frac{8179}{100000}$ ; b.  $\frac{11111}{300000}$ ; c.  $\frac{2469}{300000}$ ; d.  $\frac{1010101}{10000000}$ ; e.  $\frac{494}{625}$ ; f.  $\frac{34007}{1000000}$ ; g.  $1\frac{88887}{1000000}$ ; h.  $3\frac{988843}{10000000}$ .

- (21)  $\frac{7}{11}$  by  $\frac{1}{88}$ ,  $\frac{4}{17}$  by  $\frac{13}{136}$ ,  $\frac{4}{17}$  by  $\frac{1}{68}$ ,  $\frac{2}{11}$  by  $\frac{1}{55}$ . (22)  $\frac{1}{6}$  by  $\frac{1}{60}$ , neither. (23)  $6\frac{5}{80}$ . (24)  $\frac{1}{80}$ ,  $\frac{1}{275}$ ,  $\frac{3}{8800000}$ ,  $\frac{1}{24000}$ . (25)  $27\frac{2}{80}$ . (26)  $27\frac{2}{80}$ . (27) 0. (28)  $33\frac{17}{16}$ . (29)  $344\frac{19}{88}$ . (30)  $186\frac{28}{117}$ . (31)  $17\frac{133}{144}$ . (32) Whole property, £18,000; son, £4500; daughter, £2000; nephew and niece, £1000 each. (33) £20. 16s. (34) The second side won by 39 runs.

## XXII.

- (1)  $\frac{1}{6}$ ,  $\frac{1}{55}$ ,  $\frac{3}{100}$ ,  $\frac{27}{40}$ ,  $\frac{16}{87}$ . (2)  $27$ ,  $29\frac{1}{4}$ ,  $27\frac{1}{12}$ , 438. (3)  $1\frac{1}{2}$ , 1638. (4)  $\frac{1}{100}$ ,  $\frac{21}{100}$ ,  $\frac{77}{1000000}$ ,  $\frac{2197}{1000000000000}$ . (5)  $1853\frac{1087}{10000000}$ . (6)  $43\frac{7}{8}$ ,  $\frac{3}{27}$ ,  $311\frac{96}{225}$ .

## XXIII.

- (1) 12. (2)  $\frac{1}{12}$ . (3)  $1\frac{13}{18}$ . (4)  $\frac{15}{28}$ . (5) 9. (6)  $\frac{9}{25}$ . (7)  $\frac{3}{8}$ . (8) 3. (9)  $1\frac{3}{5}$ . (10)  $\frac{1}{5}$ . (11)  $\frac{1}{3}$ . (12)  $1\frac{2}{3}$ . (13)  $1\frac{13}{14}$ . (14)  $\frac{11}{70}$ . (15)  $\frac{1}{2}$ . (16) 5. (17)  $2\frac{4}{7}$ . (18)  $1\frac{1}{35}$ . (19)  $\frac{3}{5}$ . (20)  $1\frac{1}{2}$ . (21) 4. (22) 8. (23)  $\frac{1}{5}$ . (24)  $\frac{2}{3}$ . (25)  $\frac{1}{8}$ . (26)  $\frac{10}{13}$ . (27)  $\frac{2}{15}$ . (28) 32. (29)  $6\frac{1}{5}$ . (30) 10. (31)  $2\frac{3}{16}$ . (32)  $11\frac{69}{70}$ . (33)  $2\frac{6}{11}$ . (34)  $6\frac{231}{720}$ . (35)  $22\frac{511}{240}$ . (36) 7. (37)  $\frac{7}{8}$ . (38)  $3\frac{3}{4}$ . (39)  $\frac{1}{110}$ . (40)  $1\frac{1}{9}$ . (41) 1. (42) 1. (43) £5. 19s.  $10\frac{4}{7}d.$  (44) 2s.  $9\frac{9}{18}d.$  (45) 2 days, 10 hours, 55 min. (46) 13 lbs.  $15\frac{3}{4}oz.$  (47) 9s. 2d. (48) 5s.  $3\frac{1}{8}d.$  (49) 4400 steps. (50) 185. (51)  $\frac{68}{123}$ .

## XXIV.

- (1)  $28\frac{121}{240}$ . (2)  $10\frac{7}{72}$ . (3)  $8\frac{7}{15}$ . (4)  $17\frac{7}{75}$ . (5)  $7\frac{9}{14}$ . (6)  $22\frac{1}{4}$  pieces. (7)  $4\frac{1}{77}$ . (8)  $\frac{13}{30}$ . (9)  $\frac{29}{228}$ . (10)  $4\frac{11}{27}$ . (11)  $\frac{1}{100}$ . (12)  $28\frac{16}{27}$ . (13)  $38\frac{2}{27}$ . (14)  $4\frac{23}{45}$ . (15) 16. (16)  $56\frac{1}{4}$ . (17)  $40\frac{1}{4}$ . (18)  $12\frac{9}{16}$ . (19)  $109\frac{1}{3}$ . (20)  $3\frac{1}{7}$ . (21)  $\frac{3}{14}$ . (22)  $\frac{33}{40}$ . (23)  $\frac{1}{10}$ . (24)  $\frac{1}{2}$ . (25)  $10\frac{6}{25}$ . (26)  $\frac{11}{78}$ . (27)  $\frac{11}{78}$ . (28)  $3\frac{131}{116}$ .

## XXV. (a).

- (1) £8. 19s. 2d. (2) £17. 14s.  $4\frac{1}{2}d.$  (3) £2. 2s.  $9\frac{2}{5}d.$  (4) £11. 5s. (5) £22. 1s. (6) £16. 12s.  $9\frac{1}{3}d.$  (7) 11 hrs. (8) 593 cwts. 3 qrs. (9) £14. 8s. 9d. (10) £28. 6s. (11) £32. 18s. 6d. (12) £77. 8s. 9d.

## XXV. (b).

- (1) 36 articles. (2) 100 men. (3) 105 oz. (4) 3 qrs. 14 lbs. (5) £106. 13s. 4d. (6) £1455. (7) £2666. 13s. 4d. (8) £1110. (9) £58. 6s.  $7\frac{1}{2}d.$  (10) £33. 14s.  $9\frac{3}{5}d.$  (11) £39. 7s. 6d. (12) £1. 18s.

## XXV. (c).

- (1) £10. 4s. 2d. (2) £39. 1s.  $7\frac{1}{2}$ d. (3) £12. 13s.  $1\frac{1}{8}$ d.  
 (4) £7. 3s.  $3\frac{9}{10}$ d. (5)  $92\frac{8}{11}$  minutes. (6) 5 hrs. (7) £2. 19s. 9d.  
 (8) £60. 19s.  $1\frac{1}{2}$ d. (9) £13. 10s. (10)  $2\frac{1}{2}$  per cent. (11) £72.  
 (12) £10. 5s. 4d. (13)  $1034\frac{1}{2}$  French feet. (14) 6 miles, 6 fur.  
 148 $\frac{1}{2}$  yds.  $17\frac{1541}{187}$  kilometres. (15) 4 doz. and 2 bottles.

## XXV. (d).

- (1) £1. 1s.  $11\frac{1}{4}$ d. (2) 6s.  $8\frac{1}{2}$ d. (3) 24 miles; 1 hour,  
 44 $\frac{1}{3}$  minutes. (4)  $20\frac{22}{125}$  francs; 15s.  $10\frac{410}{1251}$ d. (5) 686 English  
 tons;  $714\frac{2}{7}$  French tons. (6) 43 yards. (7) 500 turns.

## XXV. (e).

- (1)  $33\frac{3}{4}$  loaves. (2) 84 articles. (3) 14 horses. (4)  $3\frac{1}{3}$  weeks.  
 (5)  $41\frac{2}{3}$  bushels. (6)  $20\frac{5}{11}$  yards. (7) £461. 10s.  $9\frac{2}{13}$ d.

## XXV. (f).

- (1) £1. 5s.  $9\frac{5}{8}$ d. (2) 2 tons, 16 cwt. 1 qr. (3) £7. 17s. 6d.  
 (4) £37. 10s. (5) £36. (6) £51. 6s. (7) £1. 2s. 6d. (8) £700.  
 (9) 4 per cent. (10)  $7\frac{1}{2}$  per cent.

## XXV. (g).

- (1) 36,000 rations. (2) £13,212. 10s. (3) £159. 2s. (4) 134  
 days. (5) £286. 4s.  $4\frac{1}{2}$ d. (6) 900 turns. (7)  $9\frac{11}{16}$  hours. (8) £350.  
 (9) £52. 12s.  $4\frac{4}{7}$ d. (10) £24. 13s.  $8\frac{7}{100}$ d. (11) £715. 18s.  $2\frac{2}{11}$ d.  
 (12) 10 oz. (13) 2 months. (14) £12. 13s. 2d. (15)  $48\frac{8}{9}$  hours.

## XXVI. (a).

- (1)  $\frac{3}{8}$ . (2)  $2\frac{2}{3}$ . (3)  $\frac{5}{9}$ . (4)  $1\frac{4}{5}$ . (5)  $\frac{3}{4}$ . (6)  $1\frac{1}{3}$ . (7)  $\frac{1}{3}$ .  
 (8) 3. (9)  $\frac{1}{6}$ . (10) 6. (11)  $\frac{1}{6}$ . (12)  $\frac{1}{20}$ . (13)  $\frac{1}{40}$ . (14)  $\frac{1}{80}$ .  
 (15)  $\frac{1}{240}$ . (16)  $\frac{1}{480}$ . (17)  $\frac{1}{960}$ . (18)  $\frac{4}{5}$ . (19)  $\frac{1}{20}$ . (20)  $\frac{1}{120}$ .  
 (21)  $\frac{59}{960}$ . (22)  $\frac{79}{320}$ . (23)  $\frac{2}{3}$ . (24)  $\frac{859}{960}$ .

## XXVI. (b).

- (1)  $\frac{1}{2}$ . (2) 2. (3)  $\frac{249}{615}$ . (4)  $2\frac{121}{249}$ . (5)  $\frac{92}{1023}$ . (6)  $11\frac{13}{93}$ .  
 (7)  $\frac{192}{601}$ . (8)  $3\frac{25}{162}$ . (9)  $\frac{85}{212}$ . (10)  $\frac{41}{84}$ . (11)  $\frac{9}{23}$ . (12)  $\frac{1}{11}$ .  
 (13)  $\frac{1415}{48468}$ . (14)  $1\frac{79}{123}$ . (15)  $\frac{79}{1920}$ . (16)  $1\frac{137}{1088}$ . (17)  $\frac{1}{888}$ .  
 (18)  $\frac{1}{168}$ . (19)  $\frac{3}{40}$ . (20)  $1\frac{31}{144}$ .

## XXVII.

- (1)  $\frac{3}{10}$ . (2)  $\frac{3}{11}$ . (3)  $1\frac{4}{11}$ . (4)  $1\frac{1}{2}$ . (5)  $\frac{2}{3}$ . (6)  $\frac{4}{15}$ . (7)  $1\frac{8}{9}$ .  
 (8)  $2\frac{15}{32}$ . (9) 1. (10)  $6\frac{57}{84}$ . (11)  $1\frac{10}{11}$ . (12)  $1\frac{17}{88}$ . (13) 7.  
 (14)  $1\frac{8}{9}$ . (15)  $3\frac{1}{2}$ . (16) 4. (17)  $\frac{21}{80}$ . (18)  $\frac{13}{30}$ . (19)  $\frac{2}{3}$ . (20)  $\frac{5}{8}$ .  
 (21)  $\frac{419}{1131}$ . (22)  $3\frac{14159}{100000}$ . (23) 2.

## XXVIII.

- (1)  $1\frac{1}{8}$ , 4620. (2)  $\frac{9}{88}$ , 10530. (3)  $\frac{1}{80}$ , 1. (4)  $5\frac{1}{18}$ , 14140.  
 (5)  $4\frac{1}{38}$ , 10152. (6)  $\frac{1}{3530}$ , 2520. (7)  $\frac{5}{42}$ , 85 $\frac{5}{7}$ .

## XXIX.

- (1) 105 sq. ft. (2) 30 sq. yards. (3) 10 sq. in. (4) 12 sq. in.  
 (5) 24 sq. ft. (6) 144 sq. in. (7) 9 sq. ft. (8) 3097600 sq. yds.

## XXX.

- (1) 4 yds. (2) 4 in. (3) 20 ft. (4) 10 miles.

## XXXI.

- (1) *a.* 1 sq. yd. 6 ft. 48 in. *b.* 6 sq. ft. 96 $\frac{3}{4}$  in. *c.* 28 sq. yds. 5 ft. 54 in. *d.* 10 sq. yds. 8 ft. 108 in. *e.* 1 sq. ft. 18 in. *f.* 161 sq. yds. *g.*  $\frac{21}{88}$  sq. yds. or 2 sq. ft. 21 $\frac{3}{11}$  in. *h.*  $\frac{7}{88}$  sq. yds. or 103 $\frac{1}{11}$  sq. in. *k.* 1 sq. ft. 20 $\frac{5}{8}$  in. *l.*  $\frac{1}{4}$  sq. in. (2) 290 sq. ft. of carpet, 810 $\frac{3}{4}$  of paper. (3) 42 yds. 2 ft. 10 $\frac{2}{3}$  in. of carpet, 154 yds. 1 ft. 3 $\frac{2}{7}$  in. paper. (4) 10 acres. (5) 30 $\frac{1}{4}$  sq. yds. (6) 160 acres. (7) 2 sq. fur. (8) 6 $\frac{1}{4}$  sq. yds. (9) *a.* 4 $\frac{1}{11}$  ft. *b.* 12 $\frac{244}{51}$  ft. *c.* 7 $\frac{1}{2}$  in. (10) 10 $\frac{3}{8}$  pieces, £1. 10s. 6 $\frac{9}{16}$ d. (11) £4. 17s. 11 $\frac{1}{3}$ d. (12) £11. 10s. 11 $\frac{1}{32}$ d.

## XXXII.

- (1) 120 cubic ft. (2) 1000 c. inches. (3) 432 c. in. (4) 2 c. yds. 19 ft. 1431 in. (5) 5 c. yds. 20 ft. (6) 92400 c. yds.

## XXXIII.

- (1) *a.* 3 ft. *b.* 8 in. *c.* 6 ft. *d.* 3 $\frac{5}{7}$  in. *e.* 2 ft. 7 $\frac{1}{2}$  in. (2) *a.* 5 ft. *b.* 1 ft. *c.* 59 $\frac{3}{8}$  yds. *d.*  $\frac{1}{88400}$  in. (3) *a.* 49 sq. yds. *b.* 24 sq. yds. *c.* 2 sq. yds. 5 ft. 63 in. *d.* 67 $\frac{1}{8}$  sq. in. (4) 3080 bricks. (5) 15552 stones. (6) 48 $\frac{79}{128}$  c. ft. (7) 154 sq. yds. 2 ft. 128 in. (8)  $\frac{1}{80778}$  in. (9) 19s. 1 $\frac{2322}{33}$ d. (10) 51 ac. 868 yds. 2 ft. 11 $\frac{9}{80}$  in. (11) £1. 0s. 3d.

## XXXIV.

- (1) *a.* £1. 8s. 5 $\frac{43}{112}$ d. *b.* 4 cwt. 0 qr. 21 $\frac{23}{28}$  lbs. *c.* 1 year 65 $\frac{5}{28}$  days. (2) £5. 10s. 6 $\frac{1}{2}$ d. (3) 15 $\frac{5}{8}$ . (5)  $\frac{41}{80}$ ,  $\frac{143}{160}$ ,  $\frac{109}{360}$ . (6) 31 $\frac{17}{48}$ .

- (7)  $2\frac{2}{3}$  days. (8) 4 days. (9)  $3\frac{2}{11}$  days. (10)  $1\frac{20}{11}$  days. (11) 24 days. (12)  $3\frac{1}{7}$ . (13) 18 dwt. 8 grs.,  $1\frac{1}{17\frac{1}{2}}$  oz. av. (14) 2500. (15)  $\frac{31}{8}$ . (16)  $\frac{1}{27}$ ,  $\frac{1}{26}$ ,  $\frac{1}{25}$ . (17)  $42\frac{14}{33}$  horse paces. (18) 77 ft. (19)  $1\frac{5}{18}$ . (20)  $\frac{1}{4}$ d. (21)  $15\frac{25}{117}$  ft. (22)  $35\frac{5}{9}$  ft. (23)  $\frac{2}{3}$ . (24) £18. 3s.  $8\frac{907}{1812}$ d. (25)  $358\frac{2}{7}$ . (26) £51. 13s. 4d. (27) £55. 16s. (28)  $5\frac{5}{7}$ . (29) £13200. (30)  $14\frac{10}{20}$  days. (31) a.  $38\frac{2}{21}$ . b.  $120\frac{40}{273}$ . c.  $495\frac{1115}{1323}$ . (32)  $1\frac{1}{2}$  min.,  $4\frac{1}{3}$  min.,  $3\frac{1}{3}$  min.,  $1\frac{2}{3}$  min. (33)  $\frac{5}{6}$ . (34)  $1\frac{4}{7}$ . (35)  $\frac{2}{75}$ . (36) £481. 5s. (37)  $8\frac{2}{3}$  days. A  $\frac{18}{13}$ , B  $\frac{15}{13}$ , C  $\frac{20}{13}$ ; A £1. 6s. 3d., B £1. 1s.  $10\frac{1}{2}$ d., C £1. 9s. 2d. (38)  $3\frac{3}{20}$  days; the man does most, the woman the least. (40) £2250. (41) 7s. 4d. (42)  $2\frac{111}{256}$ . (43) £7. 6s.  $6\frac{2}{21}$ d. (44) A 560, B 400 gals. (45)  $4\frac{28}{39}$  days. (46) 499440 bricks. (47) £62. 2s. (48)  $26\frac{2800}{4800}$ . (49)  $\frac{16}{525}$ . (50) a.  $11\frac{289}{440}$ . b.  $34\frac{146}{161}$ . c.  $\frac{151}{220}$ . (51) 6s. (52) 6 times. (53)  $\frac{3}{10}$ . (54)  $8\frac{1}{4}$  min. (55) 5 dwt.  $3\frac{71}{828}$  grs.;  $4\frac{11084}{21806}$  drs. (56)  $14\frac{3}{25}$ . (57)  $2\frac{2}{3}$ . (58)  $9\frac{10}{11}$  ft. (59)  $426\frac{2}{3}$  tiles. (60) 4480. (62) a.  $\frac{a}{b}$ .  $\beta$ .  $\frac{a^2+b^2+c^2}{a \times b \times c}$ .  $\gamma$ .  $\frac{a \times c}{b \times d}$ .  $\delta$ .  $\frac{a \times d}{b \times c}$ .  $\epsilon$ .  $a \times c$ .  $\zeta$ .  $a + b$ .  $\eta$ .  $\frac{b}{a \times b + 1}$ .  $\theta$ .  $\frac{a \times d + b \times c}{d}$ . a.  $\frac{a \times d - b \times c}{b}$ .  $\kappa$ .  $a \times d \pm b \times c$ . (63)  $\frac{379}{732}$ . (64)  $\frac{640}{11131}$ ,  $\frac{1000}{14697}$ . (65) £13. 15s.  $7\frac{1}{2}$ d. (66)  $81\frac{1}{47}$  rupees. (67)  $\frac{11}{12}$  in. (68)  $\frac{119}{240}$ . (69) A  $\frac{7}{15}$ , B  $\frac{1}{3}$ , C  $\frac{1}{5}$ ; A £21,000, B £15,000, C £9000. (70)  $1396\frac{4}{11}$  times.

## XXXV.

- (1) £37. 2s. (2) £864. 6s. (3) £61. 10s. (4) £849. 14s. (5) £172. 18s. (6) £457. 4s. (7) £972. 8s. (8) £137. 12s. (9) £794. 16s. (10) £32.

## XXXVI.

- (1) £2626. 16s. (2) £690. 18s. (3) £5372. 16s. (4) £3190. 10s. (5) £1485. 12s. (6) £1468. 4s. (7) £2480. 2s. (8) £3900. 16s. (9) £433. 16s. (10) £4384. 10s.

## XXXVII.

- (1) £490. 2s. (2) £424. 11s. (3) £231. 4s. (4) £188. 5s. (5) £26. 17s. (6) £64. (7) £78. 19s. (8) £32. 18s. (9) £35. 13s. (10) £252. 6s.

## XXXVIII.

- (1) £637. 19s. (2) £3035. 18s. (3) £1164. 3s. (4) £313. 19s.  
 (5) £4865. 8s. (6) £2895. 12s. (7) £525. 16s. (8) £4258. 10s.  
 (9) £3292. 14s. (10) £1333. 4s.

## XXXIX.

- (1) £423. (2) £157. 16s. (3) £1092. (4) £102. 16s. 8d.  
 (5) £79. 10s. (6) £781. (7) £128. 6s. 8d. (8) £557. 2s. 6d.  
 (9) £249. (10) £259. 13s. 4d. (11) £193. 10s. (12) £971. 12s. 6d.  
 (13) £63. 15s. (14) £181. 10s. (15) £8. 10s. (16) £707. 15s.  
 (17) £14. 6s. 8d. (18) £131. 3s. 4d. (19) £7. 5s. (20) £12674. 10s.  
 (21) £56. 7s. 6d. (22) £1428. (23) £579. 10s. (24) £10. 4s.  
 (25) £429. 5s. (26) £1. 16s. 8d. (27) £367. 8s. (28) £442. 10s.  
 (29) £308. 15s. (30) £328. (31) £4. 15s. (32) £49.  
 (33) £141. 6s. 8d. (34) £473. 5s. (35) £70. 17s. 6d. (36) £925.  
 18s. 4d.

## XL.

- (1) £181. (2) £42. 14s. (3) £38. 2s. (4) £43. 10s.  
 (5) £57. 4s. (6) £516. 4s. (7) £115. 4s. (8) £220. 2s. 2d.  
 (9) £147. 9s. 6d. (10) £51. 6s. 6d. (11) £45. 15s. (12) £151.  
 8s. 3d. (13) £45. 11s. 4d. (14) £226. 9s. 4d. (15) £203. 11s.  
 (16) £68. 3s. 8d. (17) £113. 6s. 6d. (18) £38. 16s. 8d.  
 (19) £221. 18s. 8d. (20) £75. 2s. 4d. (21) £101. 18s. 9d.  
 (22) £183. 13s. (23) £31. 5s. 2d. (24) £73. 11s. 4d.  
 (25) £115. 13s. 9d. (26) £254. 17s. 4d. (27) £43. 18s. 10d.  
 (28) £95. 0s. 8d. (29) £88. 17s. (30) £54. 3s. (31) £42. 5s. 8d.  
 (32) £226. 9s. 6d. (33) £11. 19s. 10d. (34) £85. 6s. 6d.  
 (35) £215. 5s. 6d. (36) £266. 12s. 3d.

## XLI.

- (1) £38500. (2) £748. 12s. (3) £8658. (4) £9221. 6s. 8d.  
 (5) £390272. 8s. (6) £8640. 2s. 9d. (7) £2344. 2s. 7½d.  
 (8) £25971. 8s. 9¾d. (9) £56780. 11s. 9¼d. (10) £88103. 14s. 8½d.  
 (11) £2070. 11s. 6¾d. (12) £4169. 9s. 6d. (13) £1089. 13s. 6¾d.  
 (14) £78356. 11s. 1¾d. (15) £2472. 3s. 9d. (16) £469. 14s. 9¾d.  
 (17) £311. 9s. 1½d. (18) £3013. 12s. 3½d. (19) £948. 12s. 3d.  
 (20) £224. 3s. 6d. (21) £8301. 15s. (22) £382. 8s. 2½d.  
 (23) £5265. 17s. 4d. (24) £30503. 0s. 6d. (25) £281. 14s. 8¼d.



(26) £16343. 0s. 5d. (27) £18. 5s., £82. 2s. 6d., £133. 16s. 8d.  
£410. 12s. 6d., £1183. 4s. 2d.

## XLII.

(1) £3503. 10s.  $4\frac{3}{4}$ d. (2) £3824. 12s.  $10\frac{2}{3}$ d. (3) £585. 0s.  $4\frac{3}{4}$ d.  
(4) £17869. 13s.  $9\frac{5}{11}$ d. (5) £6175. 0s.  $6\frac{3}{8}$ d. (6) £3502. 10s.  $7\frac{5}{8}$ d.

## XLIII.

(1) £74. 3s.  $5\frac{11}{16}$ d. (2) £5. 0s.  $11\frac{1}{4}$ d. (3) £13. 17s.  $3\frac{3}{4}$ d.  
(4) £25. 4s.  $4\frac{3}{4}$ d. (5) £601. 18s. 3d. (6) £6. 16s.  $4\frac{3}{8}$ d.  
(7) 192 m. 7 fur. 154 yds. (8) £45. 13s.  $3\frac{1}{11}$ d. (9) £17. 0s.  $6\frac{1}{8}$ d.  
(10) £3. 18s.  $10\frac{5}{11}$ d.

## XLIV.

(1) £2371. 4s.  $4\frac{1}{2}$ d. (2) £945. 3s.  $4\frac{11}{16}$ d. (3) £535. 15s.  $7\frac{1}{2}$ d.  
(4) £213845. 11s.  $1\frac{3}{8}$ d. (5) £1416. 12s.  $10\frac{11}{16}$ d. (6) £527. 13s.  $4\frac{1}{4}$ d.  
(7) £30. 17s.  $1\frac{7}{8}$ d. (8) £223. 0s.  $11\frac{11}{16}$ d. (9) £403. 13s.  $10\frac{7}{8}$ d.  
(10) £56. 13s.  $10\frac{1}{2}$ d. (11) £244. 18s.  $7\frac{11}{16}$ d. (12) £2384. 11s.  $7\frac{1}{16}$ d.  
(13) £12. 6s. 6d. (14) £417. 3s. 9d. (15) £37. 16s. 3d.

## XLV.

(1) 16. (2) 14. (3)  $37\frac{1}{2}$ . (4)  $2\frac{5}{14}$ . (5)  $9\frac{1}{8}$ . (6)  $10\frac{1}{8}$ .  
(7) £1. 18s. (8) £7. 7s. (9) £5. 5s.  $3\frac{3}{4}$ d. (10) 1 dwt. (11) 2 grs.  
(12) 12 dwt. (13) 1s. 8d. (14) 1d. (15) 3d. (16) 2s. 6d.  
(17)  $\frac{3}{4}$ d. (18)  $2\frac{2}{80}$ d. (19)  $\frac{7}{80}$ . (20)  $12\frac{1}{10}$ . (21) 600 sheep.

## XLVII.

I. 8. II. (1)  $11\frac{1}{2}$ . (2)  $2\frac{2}{3}$ . (3)  $3\frac{3}{14}$ . (4)  $\frac{4}{7}$ . (5)  $6\frac{1}{4}$ . (6)  $\frac{7}{80}$ .  
(7) 1. (8)  $\frac{3}{1680}$ . III. (1) 9, 16, 16, 25. (2)  $\frac{2}{3}$ ,  $1\frac{1}{2}$ ,  $1\frac{1}{2}$ , 6.  
(3)  $4\frac{3}{8}$ ,  $2\frac{3}{8}$ ,  $2\frac{3}{8}$ . (4)  $\frac{2}{3}$ ,  $\frac{1}{3}$ ,  $\frac{1}{3}$ , 1.

## XLVIII.

(1) £6. 10s.  $10\frac{1}{2}$ d. (2) £14. (3) £1. 16s. (4) £78. 1s. 3d.  
(5) 10s.  $9\frac{1}{2}$ d. (6) 6 articles. (7)  $9\frac{3}{8}$  sacks. (8) 100 yards.  
(9) 21 men. (10) 1000 miles. (11) £8. 8s.  $11\frac{1}{4}$ d. (12) £56.  
15s.  $8\frac{3}{4}$ d. (13) 26 oz. 13 dwt. 8 grs. (14) £28. 13s. 4d.  
(15) £15. 15s. (16) 11s. 8d. (17) 1 year. (18) 2 qt. 1 pt.  
(19)  $\frac{25}{1001}$  in. (20) 21 cwt. (21) £1. 1s.  $9\frac{2}{5}$ d. (22)  $67\frac{1}{14}$  articles.  
(23) £3933. 6s. 8d. (24)  $\frac{24003}{84000}$  of the ship. (25)  $9\frac{3}{4}$ . (26)  $35\frac{1}{8}$ .

## XLIX.

- (1) 20 men. (2) 4 days. (3)  $50\frac{1}{2}$  yds. (4) £772. 16s.  
 (5) 944 articles. (6) 900 Austrian workmen. (7) £600. (8) £26. 5s.  
 (9) 9528 stones. (10)  $65\frac{5}{27}$  yds. (11) 4 days. (12)  $\frac{225}{288}$  days.

## L.

- (1) £40. 10s. (2) £159. 2s. (3) 160 paces. (4) 147 balls of marble.  
 (5)  $9\frac{27}{47}d.$  (6) 25 fr.  $6\frac{2}{3}$  c. (7) £2,500,000. (8) 25 fr.  
 (9) £2. 5s.  $4\frac{32}{47}d.$  (10) 1s.  $0\frac{148922}{27889}d.$  (11) £320. 8s.  $1\frac{1}{17}d.$   
 (12) 40 lbs. (13)  $638\frac{2}{11}$  Roman miles. (14) 10 gulden.  
 (15)  $11\frac{9}{16}$  florins. (16)  $20\frac{1}{18}$  gallons. (17) £27. 2s. 6d.

## LI.

- (1) 375 yds. (2)  $1173\frac{1}{3}$  paces. (3) £13212. 10s. (4) £65. 16s.  $5\frac{1}{4}d.$   
 (5)  $1040\frac{140}{575}$  miles. (6)  $4\frac{8}{11}$  lbs. = 4 lbs.  $11\frac{7}{11}$  oz. (7)  $5\frac{1}{18}d.$   
 (8)  $5\frac{2}{3}$  lbs. = 5 lbs.  $10\frac{2}{3}$  oz. (9)  $2\frac{1}{2}$  in. (10)  $9\frac{3}{7}$  ft. (11)  $\frac{5}{18}$  in.  
 (12) 16 yds. 2 ft. (13) 5 miles, 5 yds. 1 ft. 3 in. (14)  $1\frac{98}{400}$  sec.,  
 3 yrs. 110 days, 20 hrs. 28 min. 10 sec. (15)  $1\frac{4}{5}$  ac.  
 (16)  $121\frac{7}{3}$  ft. (17) £72. 9s. 2d. (18) £6. 4s.  $9\frac{1}{2}d.$  (19) 7s.  $11\frac{1}{3}d.$   
 (20) 3 tons, 16 cwt. (21) 63 miles. (22)  $333\frac{1}{3}$  miles. (23) 7 tons,  
 16 cwt. 3 qrs. (24) £24. (25) £172. 9s. 7d. (26) £715. 10s.  $6\frac{1}{4}d.$   
 (27) a. 15. b.  $10\frac{2}{7}$ . c.  $2\frac{1}{2}$ . d.  $\frac{3}{180}$ . e.  $\frac{1}{21}$ . f.  $\frac{10}{63}$ . (28) £18.  
 9s.  $5\frac{43}{81}d.$  (29) £2. 18s.  $1\frac{21}{32}d.$  (30) £7. 11s.  $10\frac{1}{2}d.$  (31) 6 articles.  
 (32) 120 miles; 5 hrs. 23 min. 20 sec.; 3 hrs.; 4 hrs. 51 min.  
 (33) 4400 gals. (34) £56. 15s.  $8\frac{1}{8}d.$  (35) 76 lbs.  $12\frac{4}{5}$  oz.  
 (36)  $89\frac{103}{108}$  cub. in. (37) 21,000 cub. ft. (38) 8°, 12°, 20°, 28° Réaumur;  
 10°, 15°, 25°, 35° Centigrade. (39) 4° R, 5° C; 50° F, 10° C;  
 104° F, 32° R; 122° F, 50° C; 194° F, 72° R; 24° R, 30° C;  
 32° F, 0° R; 212° F, 80° R;  $30\frac{2}{3}$ ° R,  $37\frac{7}{8}$ ° C; 122° F, 40° R; 8° R,  
 10° C; 144½° F, 62½° C. (40)  $72\frac{23}{8}$  grades,  $58\frac{9}{16}$  deg. (41) 30 days.  
 (42)  $24\frac{8}{15}$  days. (43)  $\frac{4}{5}$  of the 800 yds. = 640 yds. (44)  $30\frac{2}{3}$  days.  
 (45) 750 men. (46)  $10\frac{1}{8}$  days. (47) 81 men. (48) £540.  
 (49) The thickness must be reduced in the ratio of 7 : 6, or the  
 height to 72 ft., £514. 5s.  $8\frac{4}{7}d.$  (50) 2s.  $8\frac{8}{101}d.$  (51) £612. 10s.  
 (52) 50 miles. (53) £8. 11s.  $10\frac{1}{2}d.$  (54) £187. 10s. (55) £53.  
 11s.  $6\frac{3}{4}d.$  (56)  $\frac{20}{12248}$  of the ship. (57)  $8\frac{10}{12}$  months. (58)  $91\frac{7}{11}$   
 horse's steps. (59) 600. (60)  $3\frac{9}{16}$  yds. (61) 300000.

## LII.

- (1) £1226. 13s. 4d. (2) 36 men. (3) £11. 4s. (4) 5 days.  
 (5) 30 pumps. (6) £318. 15s. (7) 8 horses. (8)  $9\frac{3}{4}$  hrs.  
 (9) 80 men. (10) £3. 15s. (11) £75. (12) £1350. (13)  $57\frac{1}{27}$  cwt.

## LIII.

- (1) £1. 9s. 2d., £2. 0s. 10d. (2) 4s. 8d., 7s., 9s. 4d. (3) 1s.,  
 2s., 3s., 4s., 5s., 6s. (4) £1050, £1350. (5) £9. 6s.  $10\frac{4}{5}$ d.  
 (6) £22. 9s. 7d., £29. 7s. 11d. (7) £12, £13. 10s., £15, £16. 10s.  
 (8) £126. 5s., £151. 10s., £212. 2s. (9)  $\frac{16}{25}$  lb. (10)  $8\frac{13}{56}$   
 (11)  $\frac{320}{887}$ ,  $\frac{420}{887}$ ,  $\frac{27}{887}$ ,  $\frac{120}{887}$ , (12) 230 oz. (13)  $16\frac{34}{41}$  carats.  
 (14)  $263\frac{1}{2}$  lbs. (15) A £45. 9s.  $1\frac{1}{11}$ d., B £56. 16s.  $4\frac{4}{11}$ d.,  
 C £68. 3s.  $7\frac{7}{11}$ d., D £79. 10s.  $10\frac{10}{11}$ d. (16) A £389. 12s.  $2\frac{2}{7}$ d.,  
 B £259. 14s.  $9\frac{5}{7}$ d., C £194. 16s.  $1\frac{2}{7}$ d., D £155. 16s.  $10\frac{4}{7}$ d.  
 (17) A £5, B £7. 10s., C £9, D £10. 2s. 6d. (18) A £2625,  
 B £2100, C £1120, D £200.

# PART III. APPROXIMATE CALCULATIONS.

## I.

- (1) Convergents,  $1, \frac{5}{6}, \frac{6}{7}, \frac{11}{13}, \frac{17}{20}, \frac{181}{213}$ ; limits of error,  $\frac{1}{6}, \frac{1}{42}, \frac{1}{91}, \frac{1}{280}, \frac{1}{4260}$ . (2) Conv.  $\frac{1}{2}, \frac{8}{17}, \frac{9}{19}, \frac{17}{36}, \frac{111}{236}$ ; lim.  $\frac{1}{34}, \frac{1}{323}, \frac{1}{884}, \frac{1}{8460}$ . (3) Conv.  $\frac{1}{2}, \frac{5}{8}, \frac{67}{121}, \frac{139}{234}$ ; lim.  $\frac{1}{10}, \frac{1}{60}, \frac{1}{1932}, \frac{1}{7774}$ . (4)  $1, \frac{1}{2}, \frac{3}{5}, \frac{5}{8}, \frac{18}{29}$ . (5)  $\frac{1}{3}, \frac{7}{22}, \frac{106}{233}, \frac{113}{255}$ . (6)  $1, \frac{4}{5}, \frac{5}{11}, \frac{14}{17}$ . (7)  $1, \frac{10}{11}, \frac{11}{12}$ . (8)  $\frac{1}{258}, \frac{1}{259}$ . (9)  $\frac{1}{147}$  of an inch.

## II.

- (1)  $\frac{2}{10}$ . (2)  $\frac{4}{10}$ . (3)  $\frac{6}{10}$ . (4)  $\frac{8}{10}$ . (5)  $\frac{128}{1000}$ . (6)  $\frac{375}{1000}$ . (7)  $\frac{625}{1000}$ . (8)  $\frac{875}{1000}$ . (9)  $\frac{3125}{10000}$ . (10)  $\frac{65}{100}$ . (11)  $\frac{8}{100}$ . (12)  $\frac{425}{1000}$ . (13)  $\frac{266625}{1000000}$ . (14)  $\frac{9296875}{10000000}$ . (15)  $\frac{812}{1000}$ .

## III.

- I. (1)  $\frac{1}{10}$ . (2)  $\frac{1}{100}$ . (3)  $\frac{1}{1000}$ . (4)  $\frac{1}{1000000}$ . (5)  $1\frac{1}{10} = \frac{11}{10}$ . (6)  $1\frac{1}{100} = \frac{101}{100}$ . (7)  $\frac{1}{10} + \frac{1}{100} = \frac{11}{100}$ . (8)  $\frac{3}{10} + \frac{1}{100} = \frac{31}{100}$ . (9)  $\frac{3}{10} + \frac{1}{100} + \frac{5}{1000} = \frac{315}{1000}$ . (10)  $\frac{3}{100} + \frac{1}{1000} + \frac{5}{10000} = \frac{315}{10000}$ . (11)  $3 + \frac{1}{10} + \frac{5}{100} = 3\frac{15}{100} = \frac{315}{100}$ . (12)  $31\frac{5}{10} = \frac{315}{10}$ . (13)  $128 + \frac{5}{100} + \frac{3}{1000} = 128\frac{53}{1000} = \frac{128053}{1000}$ . (14)  $12 + \frac{8}{10} + \frac{5}{1000} + \frac{3}{10000} = 12\frac{8053}{10000} = \frac{128053}{1000}$ . (15)  $1280 + \frac{5}{10} + \frac{3}{100} = 1280\frac{53}{100} = \frac{128053}{100}$ . II. (1)  $\frac{157}{200}$ . (2)  $\frac{3}{20}$ . (3)  $\frac{117}{160}$ . (4)  $\frac{193}{320}$ . (5)  $\frac{125}{128}$ . (6)  $6\frac{1}{32}$ . (7)  $603\frac{1}{8}$ . (8)  $\frac{11}{20}$ . (9)  $\frac{371}{1000}$ . (10)  $\frac{1}{2250}$ . (11)  $\frac{11}{20000}$ . (12)  $\frac{101}{200}$ . (13)  $5\frac{1}{20}$ . (14)  $8\frac{11}{128}$ . (15)  $\frac{91}{128}$ .

## IV.

- (1)  $33\frac{93}{100} = 33.58125$ . (2)  $5566\frac{431}{1000} = 5566.269375$ . (3)  $484\frac{27}{320} = 484.084375$ . (4)  $64\frac{11}{16} = 64.6875$ . (5)  $50\frac{4}{5} = 50.640625$ . (6)  $36\frac{239}{2000} = 36.2621875$ .

## V.

- (1)  $2\frac{31}{40} = 2.775$ . (2)  $66\frac{109}{100} = 66.68125$ . (3)  $16\frac{347}{100} = 16.8675$ .  
 (4)  $82\frac{513}{25} = 82.8192$ . (5)  $44\frac{41}{80} = 44.5125$ . (6)  $4\frac{11}{32} = 4.34375$ .  
 (7)  $7\frac{147}{160} = 7.91875$ . (8)  $\frac{621}{1600} = .388125$ .

## VI.

- (1)  $42\frac{4}{5} = 42.8$ , 428, 4280, 42800. (2)  $565\frac{15}{16} = 565.9375$ ,  $5659\frac{3}{8} = 5659.375$ ,  $56593\frac{3}{4} = 56593.75$ ,  $565937\frac{1}{2} = 565937.5$ . (3)  $86\frac{7}{8} = 86.875$ ,  $868\frac{3}{4} = 868.75$ ,  $8687\frac{1}{2} = 8687.5$ . (4)  $2\frac{31}{32} = 2.96875$ ,  $29\frac{1}{16} = 29.6875$ ,  $296\frac{7}{8} = 296.875$ ,  $2968750$ .

## VII.

- (1)  $304\frac{39}{50} = 304.78$ ,  $3047\frac{4}{5} = 3047.8$ ,  $3\frac{339}{5000} = 3.0478$ ,  $30\frac{339}{500} = 30.478$ . (2)  $142\frac{7}{8} = 142.875$ ,  $333\frac{3}{8} = 333.375$ ,  $1762\frac{1}{8} = 1762.125$ ,  $190\frac{1}{2} = 190.5$ ,  $285\frac{3}{4} = 285.75$ ,  $381$ ,  $2190\frac{3}{4} = 2190.75$ ,  $22288\frac{1}{4} = 22288.5$ . (3)  $3102\frac{31}{512} = 3102.626953125$ ,  $39\frac{3}{8} = 39.375$ .  
 (4) 1506888, 64.71, .009. (5) 34713.6, 3712.

## VIII.

- (1) 68.4714. (2) 68.4714. (3) 68.4714. (4) 6.84714. (5) .12, .00012, .03, .003, .000003, .0002, .0002. (6) .0121, .010201, .00008, .0001, 84. (7) 235.95993, 2.3595993, .023595993. (8) 86.4, 86.4, .00864. (9)  $6\frac{15}{16} = 6.9375$ ,  $1\frac{37}{80} = 1.4625$ ,  $\frac{13}{1600} = .008125$ . (10)  $\frac{107}{125} = .856$ ,  $1\frac{71}{250} = 1.284$ ,  $1\frac{89}{125} = 1.712$ ,  $2\frac{7}{80} = 2.14$ ,  $2\frac{71}{125} = 2.568$ ,  $\frac{428}{625} = .6848$ . (11)  $\frac{107}{1250} = .0856$ ,  $\frac{321}{2500} = .1284$ ,  $\frac{107}{625} = .1712$ ,  $\frac{107}{600} = .1783$ ,  $\frac{428}{3125} = .13696$ ,  $1\frac{3657}{12500} = 1.29256$ ,  $13\frac{87}{125} = 13.696$ ,  $\frac{107}{78125} = .0013696$ .

## IX.

- (1)  $3\frac{37}{160} = 3.23125$ ,  $\frac{517}{1600} = .323125$ ,  $\frac{517}{16000} = .0323125$ ,  $\frac{517}{160000} = .00323125$ . (2)  $\frac{107}{250} = .428$ ,  $\frac{107}{2500} = .0428$ ,  $\frac{107}{25000} = .00428$ .  
 (3)  $5\frac{211}{320} = 5.659375$ ,  $\frac{1811}{3200} = .5659375$ .

## X.

- (1) 374.841, 187.4205, 149.9364, 93.71025. (2) 1018.5853125, 254.646328125, 1303.7892, 31.830791015625. (3) 3.6125. (4) .0015625, .0001953125, .002, .000125. (5) .0025, .0000125. (6) .25, .125, .1, .0625. (7) .005, .0025, .002, .00125. (8) .00045625, .0000045625, .000000045625. (9)  $14\frac{11}{80} = 14.1375$ ,

$9\frac{17}{40} = 9.425$ ,  $7\frac{11}{160} = 7.06875$ ,  $5\frac{31}{200} = 5.655$ ,  $3\frac{71}{820} = 3.534375$ ,  
 $\frac{39}{80} = .4875$ . (10)  $\frac{13}{80} = .1625$ ,  $\frac{429}{18000} = .0268125$ ,  $\frac{8193}{183840000} =$   
 $.00005006103515625$ .

## XI.

(1)  $\frac{73}{1800} = .045625$ . (2)  $\frac{1}{2} = .5$ ,  $\frac{1}{4} = .25$ ,  $\frac{1}{8} = .125$ . (3) 468,  
 312, 234,  $187\frac{1}{8} = 187.2$ , 117. (4)  $32\frac{7543}{12800} = 32.589296875$ ,  $3258\frac{119}{128}$   
 $= 3258.9296875$ ,  $325892\frac{31}{32} = 325892.96875$ . (5)  $\frac{1}{8400} = .00015625$ .  
 (6) 7118580. (7)  $4\frac{3}{8} = 4.375$ . (8)  $1\frac{1}{2} = 1.5$ . (9)  $48\frac{3}{4} = 48.75$ ,  
 $487\frac{1}{2} = 487.5$ ,  $5\frac{4}{5} = 5.8$ , 58,  $\frac{29}{50} = .58$ . (10) 1,  $\frac{1}{10} = .1$ , 10, 25,  
 $\frac{1}{25} = .04$ .

## XII.

(1) 14s.  $5\frac{1}{4}d$ . (2)  $7\frac{1}{2}d$ . (3)  $5\frac{1}{2}$  lbs. (4) 292 days. (5) 14  
 min. 4.2 sec. (6)  $24\frac{1}{2}$  lbs. (7) 112.8512 yards.

## XIII.

(1) .4 years. (2) .034375 tons. (3) .23125 oz. troy.  
 (4) 7.90625 cwts. (5) £571875. (6) .04690625 of £100.

## XIV.

(1) 250.5294. (2) 1. (3)  $\frac{23}{28}$ . (4)  $4\frac{11}{800} = 4.88875$ . (5) .07884.  
 (6) 3.14159. (7) 14.6984 days. (8) 11 hours, 57 min. 41.76 sec.  
 (9) .06075. (10) 10. (11) 21 times and .0015 over. (12) 13  
 times and .0016 over. (13) .00000002635. (14) 43.72875.  
 (15) 1.5625. (16) 72315, .072315, .72315, 72315. (17) .072315,  
 72315, 7231.5, .072315. (18) 46875 fr. (19) 4.125 fr.  
 (20) 1s.  $2\frac{1}{2}d$ . (21) 1s.  $8\frac{1}{4}d = £.084375$ . (22) £3. 9s. 3d.  
 (23) £.02646 (24) 1.74. (25)  $5\frac{11}{200}$ . (26) a. 350. b. 10250.  
 c. 9750. d. .01. e. .1, f. .5. (27) 173500, 17350, 1735, 1.735,  
 .1735, .01735 metres. (28) 100 sq. decimetres, 1000000 c. cen-  
 timetres. (29) 653 c. yds. 26 ft. 392.9765 in. (30) 2.465.  
 (31) £85. (32) 4 pieces. (33) 3 cwt. 2 qrs. 26 lbs. 1 oz.  
 (34)  $64\frac{8856}{7721}$  grammes,  $1609\frac{3367}{8987}$  metres. (35) 10. (36) .03835,  
 .00635, .0003576, 1.396875. (37) £.5 by .0001 or  $\frac{12}{125}$  f.  
 (38) 1750 fr. (39) 8s.  $0\frac{1}{4}d$ . (1 gramme being 15.44 grains).  
 (40) 14 cwt. 3 qrs. 2 lbs. 4.4 oz., 360 m. 3 fur. 47 yds. 0 ft.  
 6.2 in., 2.115298408 acres, £56. 18s.  $0\frac{1}{4}d$ , 125.4552159 gallons.  
 (41) 11349.675 fr.

## XV.

(1) See pp. xvii, xviii. (2) a.  $1\frac{261}{2128}$  inch. b.  $\frac{34}{1378}$  f.

(1) Reduce  $\frac{7}{11}$  to a decimal.

$11 \overline{) 7.000}$

$\frac{7}{11} > \cdot 6$  by  $\frac{2}{11}$  ..... A  
 $\frac{7}{11} > \cdot 63$  by  $\frac{7}{110}$ , which reduces the error by .....  $\frac{3}{110}$  .. B  
 $\frac{7}{11} > \cdot 636$  by  $\frac{1}{275}$ , which further reduces the error by  $\frac{3}{275}$  ... C  
 $\frac{7}{11} > \cdot 6363$  by  $\frac{7}{11000}$  " "  $\frac{8}{10000}$  ... D  
 $\frac{7}{11} > \cdot 63636$  by  $\frac{1}{27500}$  " "  $\frac{8}{20000}$  ... E  
 $\frac{7}{11} > \cdot 636363$  by  $\frac{7}{1100000}$  " "  $\frac{8}{1000000}$  ... F

ESTIMATE OF ERROR IN DIFFERENT UNITS.

	lb. av.	Cwt.	Ton.	Yd.	Mile.	7920 miles, Earth's diameter.	93500000 miles, Sun's distance.
A $8\frac{8}{11}$ dr.	$9\frac{1}{2}$ dr.	$4\frac{4}{5}$ lbs.	2 qrs. $25\frac{5}{11}$ lbs.	$1\frac{1}{2}$ in.	64 yds.	288 m.	3400000 m.
B $13\frac{2}{11}$ dr.	$13\frac{2}{11}$ dr.	$11\frac{1}{2}$ oz.	$14\frac{1}{2}$ lbs.	$\frac{63}{375}$ in.	$11\frac{1}{2}$ yds.	$50\frac{2}{3}$ m.	595000 m.
C $9\frac{6}{11}$ f.	$13\frac{2}{11}$ dr.	$10\frac{5}{11}$ dr.	$13\frac{9}{22}$ oz.	$\frac{18}{1375}$ in.	$23\frac{1}{2}$ in.	$2\frac{2}{3}$ m.	34000 m.
D $13\frac{2}{11}$ f.	$13\frac{2}{11}$ dr.	$16\frac{8}{11}$ dr.	$2\frac{8}{11}$ oz.	$\frac{63}{37500}$ in.	$4\frac{4}{15}$ in.	$887\frac{1}{2}$ yds.	5950 m.
E $24\frac{4}{11}$ f.	$34\frac{8}{11}$ dr.	$34\frac{8}{11}$ dr.	$2\frac{8}{11}$ dr.	$\frac{9}{6875}$ in.	$\frac{144}{625}$ in.	$50\frac{8}{15}$ yds.	340 m.
F $34\frac{8}{11}$ f.	$34\frac{8}{11}$ dr.	$34\frac{8}{11}$ dr.	$34\frac{8}{11}$ dr.	$\frac{63}{375000}$ in.	$\frac{128}{3125}$ in.	$86\frac{4}{15}$ yds.	$59\frac{1}{2}$ m.

(2) Reduce  $\frac{5}{13}$  to a decimal.

13) 50 (-384615

110

60

80

20

70

5

$\frac{5}{13} > .3$  by  $\frac{11}{130}$  .....A  
 $\frac{5}{13} > .38$  by  $\frac{3}{130}$ , which reduces the error by .....  $\frac{2}{13}$  ...B  
 $\frac{5}{13} > .384$  by  $\frac{1}{162}$ , which further reduces the error by  $\frac{1}{162}$  ...C  
 $\frac{5}{13} > .3846$  by  $\frac{1}{10000}$  " "  $\frac{3}{10000}$  ...D  
 $\frac{5}{13} > .38461$  by  $\frac{7}{100000}$  " "  $\frac{1}{100000}$  ...E  
 $\frac{5}{13} > .384615$  by  $\frac{1}{1000000}$  " "  $\frac{1}{1000000}$  ...F

## ESTIMATE OF ERROR IN DIFFERENT UNITS.

£. s. d.	lb. av.	Cwt.	Ton.	Yd.	Mile.	7920 miles, Earth's diameter.	93500000 miles, Sun's distance.
A 1s. 8 $\frac{4}{13}$ d.	1 $\frac{23}{13}$ oz.	9 $\frac{21}{13}$ lbs.	1 cwt. 2 qrs. 3 $\frac{2}{13}$ in. 21 $\frac{7}{13}$ lbs.	148 $\frac{12}{13}$ in.	148 $\frac{12}{13}$ yds. 670 $\frac{2}{13}$ m.	7911538 $\frac{6}{13}$ m.	
B 1 $\frac{7}{13}$ d.	1 $\frac{59}{132}$ dr.	8 $\frac{88}{132}$ oz.	10 $\frac{22}{132}$ lbs.	8 $\frac{8}{132}$ in.	8 $\frac{8}{132}$ yds.	363 $\frac{8}{132}$ m.	431538 $\frac{6}{13}$ m.
C 10 $\frac{2}{132}$ f.	2 $\frac{56}{132}$ dr.	1 $\frac{167}{132}$ oz.	1 $\frac{123}{132}$ lbs.	3 $\frac{36}{132}$ in.	13 $\frac{27}{132}$ yds.	4384 $\frac{6}{132}$ m.	57538 $\frac{6}{13}$ m.
D 2 $\frac{4}{132}$ f.	3 $\frac{2}{132}$ dr.	3 $\frac{54}{132}$ dr.	8 $\frac{138}{132}$ dr.	9 $\frac{9}{132}$ in.	15 $\frac{84}{132}$ in.	214 $\frac{14}{132}$ yds. 1438 $\frac{6}{132}$ m.	
E 4 $\frac{2}{132}$ f.	6 $\frac{272}{132}$ dr.	20 $\frac{632}{132}$ dr.	3 $\frac{713}{132}$ dr.	3 $\frac{272}{132}$ in.	75 $\frac{93}{132}$ in.	75 $\frac{93}{132}$ yds. 503 $\frac{6}{132}$ m.	
F 3 $\frac{3}{132}$ f.	4 $\frac{48}{132}$ dr.	20 $\frac{632}{132}$ dr.	17 $\frac{92}{132}$ dr.	9 $\frac{9}{132}$ in.	5 $\frac{897}{132}$ in.	5 $\frac{897}{132}$ yds. 352 $\frac{6}{132}$ m.	



## XVI.

(1)  $\cdot 43072$ ,  $\cdot 01020$ ,  $\cdot 43080$ . (2)  $\cdot 6667$ ,  $\cdot 4444$ ,  $\cdot 2727$ ,  $\cdot 2778$ ,  $4\cdot 0909$ ,  $4\cdot 1$ . (3)  $1$ ,  $\cdot 0909091$ ,  $\cdot 001$ ,  $\cdot 38$ ,  $\cdot 43$ ,  $\cdot 36$ . (4)  $1000$ . (5)  $\cdot 1$ ,  $\cdot 06$ ,  $\cdot 059$ ,  $\cdot 0588$ ,  $\cdot 05882$ ,  $\cdot 058824$ ,  $\cdot 0588235$ ,  $\cdot 05882353$ ,  $\cdot 058823529$ ,  $\cdot 0588235294$ ,  $\cdot 05882352941$ ,  $\cdot 058823529412$ ,  $\cdot 0588235294118$ ,  $\cdot 05882352941176$ ,  $\cdot 058823529411765$ ,  $\cdot 0588235294117647$ .

## XVII.

(1)  $117\frac{43}{180} = 117\cdot 23889$ . (2)  $38\frac{979}{1287} = 38\cdot 75368$ . (3)  $46\frac{289}{1388} = 46\cdot 20851$ . (4)  $33\frac{32}{105} = 33\cdot 30476$ . (5)  $62\frac{3}{10} = 62\cdot 3$ . (6)  $5\frac{6}{7} = 5\cdot 8571$ . (7)  $\frac{43}{128} = \cdot 34127$ . (8)  $9\frac{37}{75} = 9\cdot 49333$ . (9)  $\frac{62}{75} = \cdot 82667$ . (10)  $3\frac{67}{154} = 3\cdot 43507$ . (11)  $2\frac{11}{5} = 2\cdot 73333$ . (12)  $13\frac{3}{5} = 13\cdot 6$ . (13)  $\frac{124660}{153153} = \cdot 813957$ . (14)  $1\cdot 2869695$ . (15)  $\cdot 2401961$ . (16)  $\cdot 6511628$ . (17)  $2\cdot 1032$ . (18)  $\cdot 5763$ . (19)  $80\cdot 668$ . (20)  $27\cdot 43448$ . (21)  $\cdot 5$ . (22)  $2$ . (23)  $2\cdot 718281828$ . (24)  $3\cdot 14159$ .

## XVIII.

(1)  $3\cdot 333$ ,  $333\cdot 333$ ,  $33333\cdot 333$ . (2)  $47\cdot 2727$ ,  $472\cdot 7273$ ,  $4727272\cdot 7273$ . (3)  $58\frac{8}{9} = 58\cdot 888889$ ,  $588\frac{8}{9} = 588\cdot 888889$ ,  $58888\frac{8}{9} = 58888\cdot 888889$ . (4)  $5\frac{5}{8} = 5\cdot 833333$ ,  $58\frac{1}{3} = 58\cdot 333333$ ,  $5833\frac{1}{3} = 5833\cdot 333333$ . (5)  $9285\frac{5}{7} = 9285\cdot 714286$ . (6)  $29\frac{7}{17} = 29\cdot 411765$ . (7)  $138\frac{8}{9} = 138\cdot 888889$ .

## XIX.

(1)  $4307\frac{9}{13} = 4307\cdot 6923$ . (2)  $71\frac{3}{7} = 71\cdot 4286$ . (3)  $50909\frac{1}{11} = 50909\cdot 0909$ . (4)  $4000$ . (5)  $25000$ . (6)  $2650\frac{5}{13} = 2650\cdot 4167$ . (7)  $1621\frac{23}{7} = 1621\cdot 6216$ . (8)  $87857\frac{1}{7} = 87857\cdot 1429$ . (9)  $19636363\frac{1}{11} = 19636363\cdot 6364$ . (10)  $1715\cdot 6566$ . (11)  $1666844\cdot 4444$ . (12)  $23543\cdot 5435$ .

## XX.

(1)  $11389\frac{28}{11} = 11389\cdot 6829$ . (2)  $575\frac{13}{29} = 575\cdot 4483$ . (3)  $4118\frac{2}{11} = 4118\cdot 1818$ . (4)  $2814$ . (5)  $100500$ . (6)  $110204\frac{97}{138} = 110204\cdot 7578$ .

## XXI. (a).

(1)  $44\frac{47}{7} = 44\cdot 61039$ . (2)  $2\frac{37}{80} = 2\cdot 94872$ . (3)  $1\frac{13}{120} = 1\cdot 10833$ . (4)  $\frac{641}{885380} = \cdot 00098$ . (5)  $24767283\frac{485683}{5200000} = 24767283\cdot 15176$ . (6)  $\frac{11}{1733750} = \cdot 00001$ . (7)  $\cdot 19006$ . (8)  $4\cdot 88461862$ . (9)  $3\cdot 97932$ . (10)  $\cdot 016$ . (11)  $\cdot 49426$ . (12)  $140378$ . (13)  $24900$  miles. (14)  $7899$  miles. (15)  $888200$  miles.

## XXI. (b).

- (1) 5·6675. (2) ·000024. (3) 4·381. (4) 61·243. (5) ·00020916.  
(6) ·000000274.

## XXII.

- (1) 74·35878788, ·74358788, ·00074359. (2) ·20944.  
(3) ·002114. (4) ·01784512. (5) ·16838. (6) 259·7403.  
(7) 4734·54545, 47345·45455, 4734545·45455. (8) ·0000793651.  
(9) 37·4152. (10) 646·20176. (11) 13·227513. (12) 1·02222.  
(13) ·000023. (14) ·3466842, ·0034668. (15) 34·6715136,  
3·4671514, ·3467151. (16) 1·514454894, ·000813318.  
(17) 1·5144316731, ·0008133059, ·0015144317, 8·1330589849.  
(18) ·289. (19) ·014957, ·001496, 149·57265. (20) ·01196581,  
·11965812, 1·1965812, ·00001197. (21) 0.

## XXIII. (a).

- (1) 20·6134. (2) 2·030. (3) 38·144. (4) 15·3627. (5) ·05.  
(6) 8·10292. (7) 145272. (8) ·15965. (9) ·857143. (10) ·00000007.  
(11) 2·333333. (12)  $3\frac{2}{3} = 3·66667$ ,  $1\frac{1}{27} = 1·03704$ ,  $\frac{2}{3} = ·66667$ , 49,  
 $\frac{3}{11} = ·27273$ ,  $\frac{27}{28} = ·96429$ ,  $1\frac{1}{2} = 1·5$ ,  $\frac{1}{49} = ·02041$ ,  $1\frac{8}{5} = 1·16545$ ,  
 $\frac{55}{8} = ·87302$ . (13) 1422 years, 302 years.

## XXIII. (b).

- (1) 76·8162. (2) ·0000028. (3) ·0000028. (4) 7·3883.  
(5) 80·1247.

## XXIV.

- (1) 500500. (2) 139. (3) 10000. (4)  $2422\frac{1}{2}$ . (5) 67·5.  
(6) 22·25. (7) £60, £330. (8) 788·9 ft.

## XXV.

- (1) 3280. (2) 1111111·111. (3) 3905. (4) 6·8019.

## XXVI.

- (1)  $1\frac{1093}{2187}$ . (2)  $1\frac{56}{525}$ . (3) 1111·111111. (4) 3·333333333.

## XXVII.

- (1)  $1\frac{1}{2}$ . (2)  $4\frac{1}{15}$ . (3) 16. (4)  $73\frac{1}{7}$ . (5) 1. (6) 30.

## XXVIII.

- (1)  $\frac{1}{3}$ . (2)  $\frac{7}{9}$ . (3)  $\frac{1}{9}$ . (4)  $\frac{2}{9}$ . (5)  $\frac{3}{9}$ . (6) 1. (7)  $\frac{3}{11}$ . (8)  $\frac{8}{11}$ .  
(9)  $\frac{5}{37}$ . (10)  $\frac{26}{111}$ . (11)  $\frac{8}{333}$ . (12)  $\frac{2}{27}$ . (13)  $\frac{1}{7}$ . (14)  $\frac{6}{7}$ . (15)  $\frac{3}{7}$ .  
(16)  $\frac{2}{13}$ . (17)  $\frac{131}{909}$ . (18)  $\frac{1}{41}$ . (19)  $\frac{1}{73}$ . (20)  $\frac{5}{63}$ . (21)  $\frac{7}{243}$ .  
(22)  $\frac{1}{61}$ . (23)  $\frac{468}{11111}$ . (24)  $\frac{1}{3861}$ .

## XXIX.

- (1)  $\frac{1}{35}$ . (2)  $\frac{4}{55}$ . (3)  $\frac{1}{275}$ . (4)  $\frac{2}{555}$ . (5)  $\frac{1357}{1111100}$ . (6)  $\frac{1}{10000}$ .  
(7)  $\frac{1}{925}$ . (8)  $\frac{3}{377750}$ .

## XXX.

- (1)  $\frac{3}{22}$  (2)  $\frac{99}{110}$  (3)  $\frac{28}{11}$  (4)  $\frac{17}{88}$  (5)  $\frac{13}{177}$  (6)  $\frac{5557}{99900}$   
 (7)  $\frac{2237}{9900}$  (8)  $\frac{91}{270}$  (9)  $\frac{113}{500}$  (10)  $\frac{7}{12}$  (11)  $\frac{5}{12}$  (12)  $\frac{1}{300}$   
 (13)  $\frac{11}{12}$  (14)  $\frac{1}{12}$  (15)  $\frac{5}{6}$  (16)  $\frac{289}{495}$

## XXXI.

·025, ·05, ·075, ·1, ·125, ·15, ·175, ·2, ·225, ·25, ·275, ·3, ·325,  
 ·35, ·375, ·4, ·425, ·45, ·475, ·5, ·525, ·55, ·575, ·6, ·625, ·65, ·675,  
 ·7, ·725, ·75, ·775, ·8, ·825, ·85, ·875, ·9, ·925, ·95, ·975.

## XXXII.

·0010416, ·002083, ·003125, ·00416, ·0052083, ·00625, ·0072916,  
 ·0083, ·009375, ·010416, ·0114583, ·0125, ·0135416, ·014583,  
 ·015625, ·016, ·0177083, ·01875, ·0197916, ·02083, ·021875,  
 ·022916, ·0239583, ·025.

## XXXIII.

(1) ·425, ·875, ·675, ·225, ·075. (2) ·6625, ·5625, ·9625, ·7875,  
 ·9375, ·0875. (3) ·721875, ·59375, ·93125, ·196875. (4) ·03,  
 ·0416, ·02916, ·014583, ·05416, ·36. (5) ·67083, ·8927083,  
 ·789583, ·685416, ·097916, ·0010416, ·002083, ·00416, ·8510416,  
 ·552083, ·6010416.

## XXXIV.

(1) £4. 5s., £42. 10s., £425, £4250, £42500, £425000.  
 (2) £4. 14s. 4½d., £47. 3s. 9d., £471. 17s. 6d., £4718. 15s.,  
 £47187. 10s., £471875. (3) £28. 13s. 9d., £286. 17s. 6d.,  
 £2868. 15s., £28687. 10s., £286875, £2868750. (4) £30. 16s. 10½d.,  
 £308. 8s. 9d., £3084. 7s. 6d., £30843. 15s., £308437. 10s., £3084375.  
 (5) £8. 3s. 1½d., £81. 11s. 3d., £815. 12s. 6d., £8156. 5s.,  
 £81562. 10s., £815625. (6) £46. 13s. 1½d., £466. 11s. 3d., £4665.  
 12s. 6d., £46656. 5s., £466562. 10s., £4665625. (7) £1. 6s. 0½d.,  
 £13. 0s. 5d., £130. 4s. 2d., £1302. 1s. 8d., £13020. 16s. 8d.,  
 £130208. 6s. 8d. (8) £1. 15s. 10d., £17. 18s. 4d., £179. 3s. 4d.,  
 £1791. 13s. 4d., £17916. 13s. 4d., £179166. 13s. 4d. (9) £2. 7s. 3½d.,  
 £23. 12s. 11d., £236. 9s. 2d., £2364. 11s. 8d., £23645. 16s. 8d.,  
 £236458. 6s. 8d. (10) £2. 18s. 11½d., £29. 9s. 7d., £294. 15s. 10d.,  
 £2947. 18s. 4d., £29479. 3s. 4d., £294791. 13s. 4d. (11) £3. 3s. 4d.,  
 £31. 13s. 4d., £316. 13s. 4d., £3166. 13s. 4d., £31666. 13s. 4d.,  
 £316666. 13s. 4d. (12) 14s. 7d., £7. 5s. 10d., £72. 18s. 4d.,  
 £729. 3s. 4d., £7291. 13s. 4d., £72916. 13s. 4d. (13) £2. 1s. 8d.,

£20. 16s. 8d., £208. 6s. 8d., £2083. 6s. 8d., £20833. 6s. 8d.,  
 £208333. 6s. 8d. (14) £3. 0s. 10d., £30. 8s. 4d., £304. 3s. 4d.,  
 £3041. 13s. 4d., £30416. 13s. 4d., £304166. 13s. 4d. (15) £4. 0s. 2½d.,  
 £40. 2s. 1d., £401. 0s. 10d., £4010. 8s. 4d., £40104. 3s. 4d.,  
 £401041. 13s. 4d. (16) £6. 0s. 5d., £60. 4s. 2d., £602. 1s. 8d.,  
 £6020. 16s. 8d., £60208. 6s. 8d., £602083. 6s. 8d.

## XXXV.

I. (1) £2801. 7s. 3½d. (2) £6871. 13s. 10d. (3) £26121.  
 4s. 10½d. (4) £52. 7s. 11¾d. (5) £46733. 13s. 4d. (6) £3808.  
 18s. 11¼d. (7) £21403. 5s. 2d. (8) £2005. 10s. (9) £865. 8s. 11½d.  
 (10) £913. 6s. 4½d.

II. (1) £3237. 4s. 0¾d. (2) £3809. 10s. 3¼d. (3) £6744. 10s. 9½d.  
 (4) £1568. 15s. 10¾d. (5) £10523. 11s. 8d. (6) £6556. 1s. 8d.  
 (7) £176. 5s. 10½d. (8) £102. 14s. 8¼d. (9) £188. 17s. 5¼d.  
 (10) £730. 15s. 10¾d. (11) £413. 0s. 10d.

III. (1) £15541. 19s. 0¼d. (2) £1174. 18s. (3) £10438. 0s. 7¾d.  
 (4) £8004. 10s. 7¼d. (5) £8261. 12s. 4¼d. (6) £13935. 2s. 1¾d.  
 (7) £4375. 19s. 0¼d. (8) £2141. 3s. 9¾d. (9) £7202612. 16s. 0½d.  
 (10) £22847. 7s. 1½d.

## XXXVI.

(1) £1150. 2s. 2d. (2) £5105. 13s. 1¼d. (3) £11978. 8s. 5d.  
 (4) £3011. 13s. 3½d. (5) £372. 17s. 0¾d. (6) £468. 0s. 9¼d.  
 (7) £245. 14s. 5d. (8) £3338. 4s. 8¼d. (9) £5952. 7s. 7¼d.  
 (10) £2898. 18s. 8d. (11) £9485. 9s. 6½d. (12) £20273. 9s. 0¾d.

## XXXVIII.

(1) £237. 6s. 9d. (2) £3449. 18s. 8½d. (3) £11. 16s. 5½d.  
 (4) £7. 17s. 5½d. (5) £5. 18s. 5¾d. (6) £4. 10s. 5¾d. (7) £183.  
 18s. 1½d. (8) £636. 17s. 9¾d. (9) £569. 5s. 9½d. (10) £15.  
 8s. 11½d.

## XXXIX.

(1) £64. 19s. 0¼d. (2) £120. 9s. 11d. (3) £633. 10s. 0½d.  
 (4) £74. 3s. 5¾d. (5) £4490. 15s. 10d. (6) £8. 13s. 4½d.  
 (7) £10. 1s. 8¼d. (8) £7. 7s. 6d. (9) £4. 5s. 4¼d. (10) £9.  
 3s. 2¾d.

## XL.

- (1) £13. 17s. 3½d. (2) £6. 16s. 5d. (3) £297. 7s. 0¾d.  
 (4) £12s. 6s. 6d. (5) £111. 1s. 8½d. (6) £2153. 5s. 9¾d.  
 (7) £325. 1s. 4d. (8) £4. 16s. 1¼d. (9) £3312.

## XLI.

- (1) £18. 11s. 5¾d. (2) £9. 2s. 9¾d. (3) £1. 11s. 1½d.  
 (4) £99. 10s. 2¼d. (5) £113. 19s. 2¾d. (6) £26. 1s. 8½d.

## XLII.

- (1) £146. 17s. 7d. (2) £47. 11s. 11¼d. (3) £77. 1s. 3¼d.  
 (4) £14. 19s. 0¾d. (5) £79. 12s. 3¾d. (6) £625. 10s. 6¼d.

## XLIII.

- (1) 13s. 11¾d. (2) 11d. (3) £4. 4s. 7½d. (4) £1146. 1s. 5d.  
 (5) £732. 18s. 11½d.

## XLIV.

- (1) £3. 5s. 5½d. (2) £40. 8s. 5¾d. (3) £974. 13s. 8¾d.  
 (4) £242732. 16s. 3d. (5) £7. 13s. 3¾d. (6) £5. 8s. 2¼d.  
 (7) £154. 7s. 6d. (8) £115. 6s. 7d.

## XLV.

- (1) £1611. 0s. 3¾d. (2) £1124. 6s. 5d. (3) £15392. 14s. 0¾d.  
 (4) £34. 9s. 2¼d.

## XLVII.

- (1) £15. 8s. (2) £25. 16s. 7d. (3) £4. 3s. 2d. (4) £9. 16s. 10½d.  
 (5) £11. 16s. 1¼d. (6) £64. 17s. 6d. (7) £2. 11s. 8d. (8) £183.  
 15s. (9) £27. 5s. 9d. (10) £319. 9s. 2d. (11) £4507. 12s. 4¼d.  
 (12) 24,436 births.

## XLVIII.

- I. (1) £35. (2) £35. (3) £31. 11s. 1½d. (4) £20. 1s. 4d.  
 (5) £48. 12s. 3d. (6) £6. 2s. 4¼d.  
 II. (1) 2s. 9¾d. (2) £1. 16s. 4½d. (3) 10s. 8½d. (4) £1. 14s. 6¼d.  
 (5) £109. 4s. 2¾d. (6) £12. 14s. 2¾d.  
 III. (1) £79. 9s. 7d. (2) £63. 8s. 3½d. (3) 16s. 6¼d.  
 (4) £1. 4s. 1¾d. (5) £13. 5s. 5½d. (6) £2. 1s. 7d.  
 IV. (1) £1615. 5s. (2) £1871. 19s. 3¾d. (3) £2060. 12s. 6¾d.  
 (4) £444. 13s. 8½d. (5) £259. 18s. 8d. (6) £7898. 9s.  
 V. £41. 13s. 4d.

## XLIX.

- (1) 20·482 %. (2) 3·614 %. (3) £4000. (4) £40. 4s. 9d.  
 (5) £46. 15s. 3d. (6) 22·975 % gain. (7) 12 %. (8)  $\frac{3}{8}$  %.  
 (9) £1720. (10) 66 boys. (11) £3. 9s. 2d. (12) None.  
 (13) 7 % decrease. (14) a. £9. 7s. 10 $\frac{3}{4}$ d. b. 3·703, 16·6,  
 17·379, 25, 43·59, 23·077, 18·518, 29·719 %. c. 21·390 %.  
 (15) 3·809 %.

## L.

- (1) 1 month. (2) 222 days. (3) 3 $\frac{1}{2}$  years. (4) 7 %. (5) £10632.  
 18s. 2 $\frac{3}{4}$ d. (6) £9. 6s. 5 $\frac{3}{4}$ d. %. (7) £912. (8) a. £2. 1s. 11d.  
 b. £1093. 15s. c. 3 $\frac{3}{4}$  %. d. 217 days.

## LI.

- (1) a. £423. 16s. 4d. b. £6260. 15s. 9d. c. £775. 3s. 5d.  
 d. £81. 16s. 5 $\frac{3}{4}$ d. e. £441. 1s. 11 $\frac{3}{4}$ d. f. £1238. 16s. 10 $\frac{1}{2}$ d.  
 (2) a. £5. 19s. 9 $\frac{1}{2}$ d. b. £4. 15s. 2 $\frac{1}{2}$ d. c. 1s. 2d. d. £14. 13s. 7d.  
 (3) a. £622. 18s. 0 $\frac{3}{4}$ d. b. £483. 9s. 8 $\frac{1}{2}$ d. c. £369. 17s. 1d.  
 (4) a. 8 $\frac{1}{4}$ d. b. 3s. 5d. c. 11s. 2 $\frac{1}{2}$ d.

## LII.

- (1) 18s. 9d. (2) 3s. 10d. (3) £651. 5s. 7 $\frac{3}{4}$ d. (4) £105. 5s. 3 $\frac{1}{4}$ d.  
 (5) £70. 6s. 3d. (6) 18 %. (7) £816. 13s. 4d. (8) 3·96d.  
 (9) 19s. 2d. (10) 50 %. (11) 5·563 pence. (12) 4 %.  
 (13) 43·119 % gain. (14) 5 $\frac{1}{3}$  apples. (15) 419·388 fr.

## LIII.

- (1) a. £48. 9s. 5d. b. £628. 17s. 10 $\frac{3}{4}$ d. c. £3. 1s. 4 $\frac{3}{4}$ d.  
 d. £13. 4s. 4d. e. £130. 15s. 5 $\frac{1}{4}$ d. f. £73. 5s. 2d. (2) £10. 0s. 0 $\frac{3}{4}$ d.  
 (3) £10. 6s. 5d. (4) £124. 17s. 4 $\frac{1}{2}$ d., £126. 3s. 4d., £126. 16s. 6d.

## LIV.

- a. £411. 7s. b. £679. 6s. c. £884. 1s. 5 $\frac{1}{4}$ d.

## LV.

- (1) £9061. 13s. 3d. (2) £833. 3s. 1 $\frac{3}{4}$ d. (3) £320. 5s.  
 (4) £59. 17s. 4d.

## LVI.

- (1) £7901. 3s. 9d. (2) £687. 3s. 5d. (3) £754. 10s. 4 $\frac{1}{2}$ d.  
 (4) £677. 11s. 9 $\frac{1}{2}$ d. (5) £539. 5s. (6) £847. 7s. 11 $\frac{1}{2}$ d. (7) £576.  
 13s. 4d. (8) £25030. 13s. 5d.

## LVII.

- (1) £30732600. (2) *a.* £1500 loss. *b.* 0. *c.* £1548 gain.  
*d.* 405 francs gain.

## LVIII.

- (1) £42. 12s. 4½*d.* (2) £327. 17s. 4½*d.* (3) £76. 14s. 6½*d.*  
 (4) £2808. 15s. (5) £3760. 14s. 3½*d.* (6) £42. 11s. 4½*d.*, £327.  
 8s. 5½*d.*, £76. 10s. 7½*d.*, £2812. 10s., £3766. 1s. 5½*d.* (7) *a.* 3·394%  
*b.* 4·484% *c.* 5·681% *d.* 5·232% *e.* 7·362% *f.* 12·987%

## LIX.

- (1) *a.* 4 per cents. *b.* 3½ per cents. *c.* 5½ per cents. (2) *a.* 5s. 1½*d.*  
*b.* £1. 14s. 8*d.* *c.* £4. 9s. 8½*d.* (3) £50. 8s. 11*d.*

## LX.

- (1) £113. 15s. 8½*d.* (2) £86. 9s. 8½*d.* (3) £80. 14s.  
 (4) £49. 0s. 4½*d.* (5) £149. 3s. 4*d.* (6) £60. 17s. 5*d.*

## LXI.

- (1) £2014. 16s. 8*d.* decrease, £17. 0s. 2*d.* increase, 6s. 5½*d.* %  
 increase. (2) £4947. 5s. 3½*d.* increase, 14s. 4½*d.* increase, 3½*d.* %  
 increase. (3) £51. 3s. decrease, £4. 17s. 1*d.* increase, 18s. 4½*d.*  
 increase. (4) £428. 2s. 7*d.* decrease, £2. 17s. 1*d.* increase, 1s. 9½*d.* %  
 increase. (5) £743. 15s. 10*d.* decrease, 0, 0. (6) £9455. 12s. 11*d.*  
 increase, £682. 15s. 7½*d.* increase, £7. 7s. 2*d.* increase.

## LXII.

- (1) £18. 7s. 6*d.* (2) 83½. (3) 15¾%. (4) *a.* £4. 16s. 4½*d.*  
*b.* £5. 0s. 9½*d.* *c.* £4. 15s. 2½*d.* *d.* £3. 14s. 7½*d.* (5) £8. 13s.  
 (6) £36. 17s. 3½*d.* (7) £5787. 9s. 3*d.* (8) 72⅞. (9) £16500  
 stock, £14746. 17s. 6*d.* (10) £1024. 4s. 8*d.* (11) £139. 0s. 7½*d.*  
 (12) 93⅝. (13) 107⅜. (14) £16. 1s. loss. (15) Decrease in  
 capital, £84. 18s. 11*d.*, increase in income, £25. 6s. 7½*d.* (16) 90½.  
 (17) 95·677. (18) £2035. 2s. 6*d.* (19) £457. 9s. 3*d.* stock,  
 commission, 11s. 5½*d.* (20) £8. 4s. 6*d.* %, dividend £91. 16s.  
 (21) £502. 2s. 10*d.*

## LXIII.

- (1) 2. (2) 7. (3) 10. (4) 30. (5) 400. (6) 5000. (7) 13.  
 (8) 17. (9) 57. (10) 123. (11) 763. (12) 247. (13) 978.  
 (14) 8276. (15) 534762. (16) 708. (17) 40093. (18) 203975.  
 (19) 3100. (20) 11111. (21) 53784912. (22) 93. (23) 1 furlong.

## LXIV.

- (1) 70 and 100 over. (2) 41. (3) 79, 476, 11, 287, 1.  
(4) 55696, 81796, 9998244, 123454321, 776161, 4853209.

## LXV.

- I. (1) 1·7320. (2) 4·3589. (3) 3·3166. (4) 2·2638. (5) 2·7018.  
II. (1) 1·41421356, ·44721359, ·14142135, ·04472136. (2) 4,  
1·26491106, ·4, ·12649110, ·00126491. (3) ·40824829, ·40201512,  
·12655439. (4) ·6, ·4, 16.  
III. (1)  $1\frac{3}{4} = 1·75$ . (2)  $1\frac{2}{15} = 1·1\bar{3}$ . (3)  $7\frac{1}{2} = 7·2$ . (4)  $3\frac{8}{9} = 3·\bar{8}$ .  
IV. (1) ·790569415048. (2) ·606976978666. (3) ·072760687510.  
(4) ·707106781187. (5) ·577350269189. (6) ·182574185835.  
(7) ·057735026919. (8) ·05. (9) ·015811388301. (10) ·125590089825.  
V. (1) 8·616. (2) ·024. (3) 145. (4) 15. (5) 1·653. (6) ·765.  
(7) ·707. (8) ·603. (9) 31·622. (10) 2·773.  
VI. (1) 60. (2) 1·414. (3) 70. (4)  $3\frac{3}{7}$ .

## LXVI.

- (1) 30 ft. (2) 181 ft. (3) 26 inches. (4) 1 inch. (5) 61 ft.  
(6) a. 187·3499. b. ·7071. c. 2. (7) 325 ft. (8) 141·4213.  
(9) 70·7106. (10) 86·6025. (11) 115·47. (12) 546 ft.

## LXVII.

- (1) 41. (2) 48. (3) 59. (4) 84. (5) 73. (6) 67. (7) 15.  
(8) 22. (9) 38.

## LXVIII.

- I. (1) 96. (2) 343. (3) 106. (4) 2009. (5) 4865. (6) ·258.  
(7) ·0016. (8) ·0401.  
II. (1) ·875. (2) ·1. (3) ·7631. (4) 1·0861. (5) ·9410.  
(6) 2·5022. (7) ·9499. (8) ·4641. (9) ·2154. (10) ·1.  
III. (1) 23. (2)  $13\frac{1}{2}$  square yards.

## LXIX.

- (1) a. 33·452 kilog. b. 81·705 Russian lbs. c. 59·707 Austrian  
lbs. d. 71·525 Prussian lbs. (2) a. 25 tons, 4 cwt. 1 qr. 17 lbs.  
b. 52·156 Russian packen. (3) 1s.  $9\frac{1}{4}d$ . (4) 6s. 9d. (5) 18·307 fr.  
(6) 254·7 litres. (7) 29·922 in. (8) 2 a. 1 r. 35·38288 sq. p.,  
4·61712 poles. (9) 39·37079 in. (10) 6·367 grains. (11) 10 hec-  
tolitre = 1 cubic metre, 3714·14 gallons. (12)  $4\frac{3}{4}d$ . (13) 2·751211



bushels, 8s.  $4\frac{1}{4}d.$  (14) 7 m. 4 fur. 164 yds. (15) 10·63 inches, 433 cwt. 5·6 lbs. (16) £2. 9s. 9d. (17) 23·302 miles. (18) 1·037 kilogs. (19) 6d. (£·0246). (20) 16s. 11d.

## LXX.

(1) 183959. (2) 2649186966618. (3) 3165·3502. (4) ·6.  
 (5) 35000. (6) a. 393351 and 15 over, 257713 and 7 over, 191632 and 36 over, 152524 and 8 over, 126672 and 36 over.  
 b. 1138411 and 28 over, 45317 and 4134 over, 567778 and 395 over, 56777 and 3587 over. c. 86300649 and 82 over, 8552316 and 649 over, 854461 and 8794 over. d. 47181 and 76 over, 4637 and 725 over, 462 and 5662 over. e. 55316 and 518 over, 5549 and 1495 over, 5493 and 6432 over. (7) 7·78048, 406·461|538, 310·82352941|17647053, 278·105263157|894736842, 229·73913043478|26086956521, 170·451612903225806, 112·42553191489361702127659|57446808510638297872340, 10·674, 1·763096429. (8) ·0073036518259, ·047522750252, ·011909527622.

## MISCELLANEOUS EXAMPLES.

(1) a.  $36\frac{347}{800} = 36·43375$ . b.  $2\frac{149}{180} = 2·93125$ . c.  $\frac{8}{32000} = ·00009375$ ,  $1562\frac{1}{2} = 1562·5$ . d.  $4\frac{3}{8} = 4·375$ ,  $7\frac{13}{16} = 7·8125$ ,  $78\frac{5}{8} = 78·125$ .  
 (2)  $\frac{5}{37}$ ,  $\frac{17}{111}$ ,  $\frac{1}{74}$ ,  $\frac{79}{370}$ ,  $\frac{15}{1111}$ ,  $\frac{61}{4500}$ ,  $\frac{23}{1500}$ . (3) a. £9203. 19s.  $2\frac{1}{2}d.$   
 b. £11163. 2s.  $6\frac{1}{4}d.$  c. £6075. 19s. 4d. d. £240. 9s.  $6\frac{3}{4}d.$   
 e. £45. 6s.  $6\frac{3}{4}d.$  f. £3. 3s.  $4\frac{1}{2}d.$  g. £24. 15s.  $5\frac{3}{4}d.$  (4) 437·962.  
 (5) 2·4898. (6) 6·928. (8) £29. 8s.  $0\frac{1}{2}d.$ , £31. 7s. 9d., £32. 2s.  
 (9) ·027. (11) ·66. (12) 16·502. (13) ·184390888. (14)  $247\frac{1}{2}$ .  
 (15)  $\frac{43}{111}$ . (16)  $1\frac{13}{47}$  days,  $\frac{20}{47}$ ,  $\frac{15}{47}$ ,  $\frac{12}{47}$ . (17) £1660. 15s.  $0\frac{3}{4}d.$   
 (18) ·32505. (19) £3. 9s.  $1\frac{1}{2}d.$  (20) 326·4. (21) 10 years.  
 (22) ·864. (23)  $5\frac{1}{2}d.$  (24) ·4875, 7605. (25) £6. 13s. 5d.  
 (26) £1072, £8. 18s. 8d.%. (27) a. 610. b. 3·333333333.  
 (28) 3s.  $9\frac{1}{2}d.$  (29) 42 ft. (30) 10s. 6d. (31) ·028. (32)  $19\frac{1}{3}$  days.  
 (33) 30 hours, 5 days. (34) 15 in.,  $6\frac{1}{4}$  in.,  $5\frac{5}{8}$  sq. in. (35)  $25\frac{10}{11}$ ,  $\frac{2}{3}$ ,  $1\frac{13}{15}$ . (36) £16. 8s. 9d., 414·554 francs, 109·583 thalers.  
 (37) 5. (38) ·507936, ·285714. (39) £585. 2s.  $1\frac{1}{2}d.$  (40) a.  $2\frac{23}{25}f.$ ,  $2\frac{10}{11}f.$ ,  $2\frac{98}{111}f.$ ,  $3\frac{1}{5}f.$  b. 1 cwt. 2 qrs.  $18\frac{2}{3}$  lbs., 1 cwt. 2 qrs.  $19\frac{7}{8}$  lbs., 1 cwt. 2 qrs.  $18\frac{106}{99}$  lbs. c. 5 oz., 4 oz. 19 dwt.  $22\frac{62}{111}$  grs.  
 d. 2·5344 drs.,  $2\frac{14}{25}$  drs. e.  $3\frac{17}{87}$  gills,  $3\frac{181}{225}$  gills. (41)  $431\frac{487}{1025}$ .

- (42) The latter. (43)  $\frac{93}{84}$ . (44) 24 sq. ft. 108 in. (45) £1351.2s.  $8\frac{1}{4}d$ .  
 (46) 1407, 2·6692, ·6546, ·5, ·5916, ·005, ·1581, ·0316.  
 (47) £1. 8s.  $1\frac{1}{2}d$ . (48) 160 Napoleons = £127. (49) 46·36321  
 (50) £2. 5s. (51)  $5t \cdot 38t4 = 70$  ft.  $44\frac{31}{8}$  in. (52)  $10124\frac{31}{8}$ .  
 (53) N.W., G.N., G.E., S.W., G.W. (54) G.N., N.W., S.W., G.E.,  
 G.W. (55)  $2\frac{1}{4}d$ . (56) £262. 15s. 8d. (57) £9. (58) 408 yards.  
 (59) £315. (60) 1119744. (61) 157464. (62) ·5. (63) £6. 2s. 6d.  
 (64) £91. 17s. 9d., 9d. (65)  $7\frac{1}{2}$  years. (66) £419. 17s. 2d.  
 (67) ·515625. (68) £1303. 6s. 8d. (69) £27. 8s.  $6\frac{3}{4}d$ . (70) £245. 5s. 5d.  
 (71) 20 years, 15 years. (72) 2s. 1d. (73) 2·3016. (74) £148.  
 15s.  $0\frac{1}{4}d$ . (75) 62·516 cwt. of copper, 6·876 cwt. of tin. (76) £24.  
 (77)  $\frac{13}{29}, \frac{41}{456}$ . (78) 1330. (79) 17·291 miles. (80) £23. 2s.  $5\frac{1}{4}d$ .  
 each officer, £17. 6s. 10d. each midshipman, £6. 7s. 2d. each sailor.  
 (81) 13s.  $8\frac{3}{8}d$ . in the £, £346. 0s. 7d. (82) £92722. (83) 3%.  
 (84) 2 hrs. 48 min. (85) £569. 13s. 11d. (86) £40. 14s.  $10\frac{1}{4}d$ .  
 5·03 %. (87) £13750. (88) £18. 8s.  $3\frac{1}{2}d$ . £27. 13s.  $9\frac{1}{4}d$ .  
 (89) 413·25714, 24·19801. (90) 1·00486944. (91) 49177328·3519.  
 (92) £2067. 10s. (93) 7s. 6d. (94) £9898. (95) £1000.  
 (96) £1. 13s.  $10\frac{1}{2}d$ . (97) 35·410714285. (98)  $5\frac{3}{4}d$ . (99) Half-  
 past four. (100)  $12\frac{1}{5}$ . (101) ·00298828125. (102) 160 men.  
 (103) £5 loss. (104) A. £284. 4s.  $2\frac{1}{2}d$ . B. £315. 15s.  $9\frac{1}{2}d$ .  
 (105) £474. 8s.  $5\frac{1}{2}d$ , £363. 0s.  $8\frac{1}{2}d$ , £412. 10s. 10d. (106) £235.  
 17s. 3d., £285. 17s.  $10\frac{1}{2}d$ , £238. 4s.  $10\frac{1}{2}d$ . (107) 9s.  $8\frac{1}{2}d$ ,  
 £29. 6s.  $7\frac{1}{2}d$ . (108) 50 %. (109) 14 yds. 1 ft. (110) 55734,  
 208577. (111) ·21785. (112) 2557 times. (113) £11. 13s. 4d.  
 (114) £978. 2s. 6d. (115) 34·56,  $\frac{12}{13}$ . (116) 9. (117)  $4\frac{4}{5}^{\circ}$  C,  
 $3\frac{5}{9}^{\circ}$  R, -40° C, -32° R. (118) £5453. 13s.  $5\frac{3}{4}d$ . (119) £345.  
 (120) £84. 8s.  $3\frac{1}{4}d$ , £2593. 16s.  $0\frac{1}{4}d$ , £6. 10s.  $4\frac{1}{2}d$ . (121) £302076.  
 19s. 10d. (122) £815. 14s. 1d. (123) 49 lbs. 4·655 oz. (124) 12 days.  
 (125) 1·02 %. (126)  $4\frac{1}{4}$  sq. yds., 17s. (127) ·997916. (128) 6400.  
 (129) £2693. 14s.  $7\frac{1}{2}d$ , £811. 1s. 5d. (130) £2. 16s.  $0\frac{1}{2}d$ .  
 (131) a. 5·899. b. 128875·773. c. 340800·388. (132) 60996·9.  
 (133)  $2\frac{34}{48}$ , ·063. (134) 18s., 7·563 %. (135) £1250000,  
 £128048. 15s.  $7\frac{1}{4}d$ . (136) 4·92, 55·9, 27·5028,  $\frac{246}{2795}$ .

- (137) £4166. 13s. 4d. (138) 86. (139) 196·76127667, 38·72983346, 12·24744871, 2·64575131, ·83666002, ·26457513, 7, 2·21359436, ·7, ·70352626, ·583. (140)  $91\frac{19}{27}$  gr.,  $82\frac{2}{15}$  deg. (141) £97. 5s.  $11\frac{1}{2}$ d., £118. 18s.  $4\frac{1}{2}$ d. (142) £12. 1s. 6d., £8. 1s., £6. 0s. 9d. (143) The first, 1·355 %. (144) £1. 15s. 5d. per dozen loss. (145) ·75. (146) £25. (147) 140 c. ft.  $729\frac{13}{18}$  in. (148) 3·129 %. (149)  $\frac{1}{2}$ ,  $\frac{3}{7}$ ,  $\frac{13}{30}$ ,  $\frac{68}{157}$ ;  $\frac{1}{14}$ ,  $\frac{1}{210}$ ,  $\frac{1}{1710}$ . (150) £274. 13s. 9d. (151) £89. 12s. (152) ·00000001872. (153) £68. 19s.  $1\frac{3}{4}$ d. (154) £74. 2s. 6d. (155) £2. 19s. 10d. (156) 22, 7, 12 gals. (157) 18·41 times. (158) 25920 years. (159) 20 min. 9·956 secs. (160) £232. 0s.  $7\frac{1}{4}$ d. (161) £23200000, 7·887 %, the 5 %. (162) 3100 men. (163)  $6\frac{2}{3}$  % profit. (164) £1860, 2 years. (165) ·99727. (166) £3. 10s. (167) 358 persons. (168) £989. 12s. 6d. (169) 101 tons, 5 cwt. 2 qrs. 19 lbs. (170) 75. (171) A. (172) 120000. (173) £75. (174) 12·8375. (175) 3 non., 4 non., 4 non., 10 non., 5 non., 6 rec., 3 non. + 6 rec., 6 rec., 6 rec., 6 rec., 1 non. + 6 rec., 78 rec., 30 rec., 198 rec., 1 non. + 6 rec. (176) 687500. (177) 6 games, £2. 16s. (178)  $\frac{1}{4+1}$   
 $\frac{\frac{1}{2}, \frac{5}{21}, \frac{31}{130}, \frac{222}{931}}{\frac{1}{84}, \frac{1}{2730}, \frac{1}{121080}}$ . (179) 8 %.  $\frac{5+1}{6+1}$   
 $\frac{7}{7}$   
(180) 237500 fr. (181) 28·78 %. (182) £2. 8s.  $1\frac{1}{2}$ d. (183) 3·297 ft. (184) 101. (185) 1·394. (186) 2·04 knots. (187) £12. 5s.  $10\frac{1}{2}$ d., £2. 5s. 10d. (188) £11. 2s. 11d., £3. 8s.  $9\frac{1}{2}$ d. (189) 69·5 yards. (190) £1417. 10s. (191) 3s. 3d. (192) £8000, £7530. (193)  $9866\frac{2}{3}$  c. ft. (194) 3 ft. (195) See Ch. VII. § 8. (196) 23·4 min. (197) £6. 18s.  $7\frac{1}{4}$ d. (198) 1,  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{5}$ ,  $\frac{8}{13}$ . (199) 655 : 528. (200) 16000. (201) £741286506. 7s.  $8\frac{1}{2}$ d. (202) 24700·44 fr. (203) £533. 6s. 1d. (204) 153 c. yds. (205) 1·71 ft. (206) 10·8 oz. (207) 2 dearer, 1 cheaper. (208) ·6ee51, ·7, ·700t5, ·70052. (209) 4 shares, £235. (210)  $\frac{2}{11}$ . (211) 39·3708 in. (212) See Ch. VI. § 19. (213) £40. 13s.  $10\frac{1}{2}$ d. (214) I gain 3s. 9d. (215) ·011, ·10, ·12, ·14, ·213, ·24, ·3, ·3, ·375, ·46; 110100011·001, 120112·010212, 12203·021, 3134·032412, 1535·05, 1136·1, 643·1, 515·125, 419·142857, 2te186t35. (216) The difference has no factors but 2 and 5, which cannot measure odd numbers that are not multiples of 5. (217)  $19\frac{1}{4}$  women. (218) 300 boys. (219) a. ·28. b. ·1650. c. ·1013223201.

- (220) 160 oz. = £623. (221) 2 tons, 17 cwt. 3 qrs. 10·059 lbs.  
 (222) 34·842 ft. (223) In 6 days altogether. (224) £2. 10s.  
 (225) £3. 3s. 3d. (226) 18·33 seconds. (227) 6·194 %.  
 (228) £4. 15s. 2d. (229) 24½. (230) £3339. 15s. (231) 300  
 strokes. (232) 11224869038·518. (233) 8 months. (234) 129 days,  
 or 4·24 months. (235) 29½ days. (236) £1678. 12s. 9d.  
 (237) *a*. The sum is increased by twice that quantity. *b*. The  
 difference is unaltered. (238) *a*. The sum is unaltered. *b*. The  
 difference is increased or diminished by twice the quantity according  
 as the greater of the two is increased or diminished. (239) *a*. The  
 product is multiplied by the square of the number. *b*. The quotient  
 is unaltered. (240) *a*. The remainder is diminished by that number  
 × the quotient. *b*. The remainder is increased by that number.  
 (241) The remainder is (*a*) multiplied, (*b*) divided by that number.  
 (242) A proper fraction is increased; an improper fraction dimin-  
 ished. (243) The ratio is multiplied by the square of the number.  
 (244) The square is increased by the square of the new number,  
 and twice the product of the two numbers. (245) Twice the pro-  
 duct of the two numbers. (246) (*a*) The sum (*b*) the difference is  
 multiplied by the number. (247) Each is multiplied by that number.  
 (248) It must be halved. (249) *a*. 1,  $\frac{10000000}{10000001}$ , 1,  $\frac{9999999}{10000000}$ .  
 (250)  $I = \frac{p \times r \times t}{100} = \frac{p \times 3 \times d}{100 \times 365}$ , where *d* is the number of days,  
 $= \frac{p \times 2 \times d \times 240 \times 3}{100 \times 730}$  (in pence)  $= \frac{p \times 2 \times d}{100} \times \frac{72}{73} = \frac{p \times 2 \times d}{100} \times (1 - \frac{1}{73})$   
 $= \frac{p \times 2 \times d}{100} \times (1 - \frac{1}{70})$  (nearly. Maximum error,  $(\frac{1}{70} - \frac{1}{73}) \times \frac{p \times 730}{100} =$   
 $\frac{3}{1000} \times p = 3d.$  on every £700 = 1s. on every £2800.

